CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

SECTION A. General description of project activity

A.1 Title of the project activity:

"Usina Interlagos Cogeneration Project"

PDD version number: 21

Date: 05/05/2011

A.2. Description of the project activity:

The primary objective of the Usina Interlagos[1] Cogeneration Project (hereinafter referred as Interlagos Project) is to supply Brazil's rising demand for energy due to economic growth and to improve the supply of electricity, while contributing to the environmental, social and economic sustainability by increasing renewable energy's share of total the Brazilian and the Latin America and the Caribbean region's electricity consumption. One fundamental goal of the project is the efficient use of resources, particularly indigenous resources, while minimizing impact on the environment.

Interlagos Project consists of a new sugar mill which became operational in May 2007. Hence, the scenario existing prior to the start of the implementation of the project activity is a site where no power was generated. The plausible baseline scenarios, as identified in section B.4, are: for power generation, P1 and P4 in conjunction with P5; for heat generation: the plausible baseline scenarios are H1 and H2; for biomass: the plausible baseline scenario is B4 .This plant is capable of generating power surplus for sale (Figure 1) and, at the same time, generating carbon credits contributing to the sustainable development. This renewable energy project is owned by Usina Santa Adélia located in Pereira Barreto. Both are sugar cane based distilleries.

The project will be implemented in 2 phases. First phase started in February 2006 with the planting of an 8.2km2 area which will be gradually increased each year up to 210km2 in 2010. The cogeneration power plant installed capacity in the first phase is 40MW. In 2010 the second phase will start with plantation expansion to reach the goal of 3.6 million tonnes of sugarcane production and implementation with another 40MW cogeneration power plant. The cogeneration project will generate enough energy not only for powering the sugar mill (thus eliminating the consumption of energy from the grid), but also for delivering surplus energy to the national grid. This electricity given to the grid will displace energy that the government would have provided with a strong use of fossil fuels. This displacement of energy thus creates a reduction of greenhouse gases emissions. This project also creates social and economical benefits that constitute a real contribution to Brazil's sustainable development.

[1] During the validation process period, "Usina Interlagos" had changed its name to Santa Adélia-Pereira Barreto branch. For the CDM process the name "Usina Interlagos" will be maintained to not lose the history of the project.

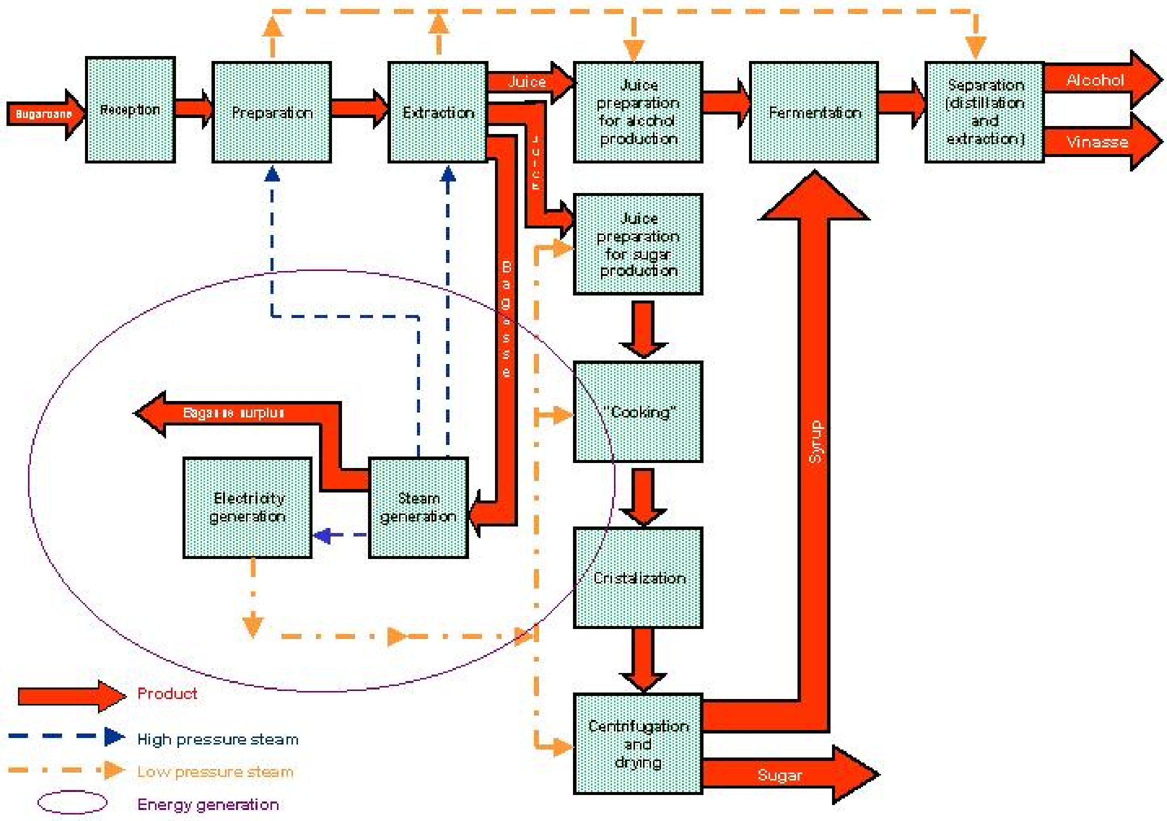


Figure 1 - Flowchart of the electricity generation inside a Sugar and Alcohol Production (Source: Codistil)

The Project can be seen as an example of a solution by the private sector to the Brazilian electricity crisis of 2001, contributing to the sustainable development of the country. Interlagos Project thus comes to prove that with the commercialization of CERs, it is viable to develop a generation project in Brazil. This will have a positive effect for the country beyond the evident reductions in GHG.

The revenues obtained from the sale of the CERs will also help Usina Interlagos to support the community the way Usina Santa Adélia does. Usina Santa Adélia has a strong social responsibility evidenced in numerous initiatives, including: working with local communities on environmental education projects, reforestation of degraded areas, regular water quality assessment, support for environmental parks, hiring of local manpower, erosion control, and support for community agriculture. This revenue distribution and social efforts must be added to the environmental benefits when evaluating the contribution to sustainable development of this project activity.

Additionally, income distribution will be derived from this project due to job creation, employees' salaries and package of benefits such as social security and life insurance, and credits of emission reductions. Additionally, lower expenditure is achieved due to the fact that money will no longer be spent in the same amount to "import" electricity from other regions in the country through the grid. This money would stay in the region and be used for providing the population better services which would improve the availability of basic needs. This surplus of capital could be translated in investments in education and health that would directly benefit the local population and indirectly in a more equitable income distribution.

Sugarcane plantation is seeing as a land destroying cultivation. However, Usina Santa Adélia, has been cultivating sugarcane for almost 60 years in the same land. This evidences that applying the proper conservation techniques this plantation will not degrade the soil. The same techniques will be used at in Pereira Barreto, among then it can be mentioned the usage of 7 different types of sugarcane, rotating land use, constant soil analyses and monitoring.

A.3. Project participants:

Detailed contact information on party(ies) and private/public entities involved in the project activity is listed in Annex 1.

Table 1 – Party(ies) and private/public entities involved in the TSACP Project activity

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	Usina Santa Adélia S/A (Private Entity)	No
	Ecopart Assessoria em Negócios empresariais Ltda. (Private Entity)	
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil

A.4.1.2. Region/State/Province etc.:

São Paulo State

A.4.1.3. City/Town/Community etc:

Pereira Barreto City

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

Usina Interlagos is located in Pereira Barreto, state of São Paulo, southeast region of Brazil, Rodovia SP 310, km643, CEP: 15370-000, Pereira Barreto. Pereira Barreto is a town of 24,680 inhabitants and its principal economic activity is the tourism.

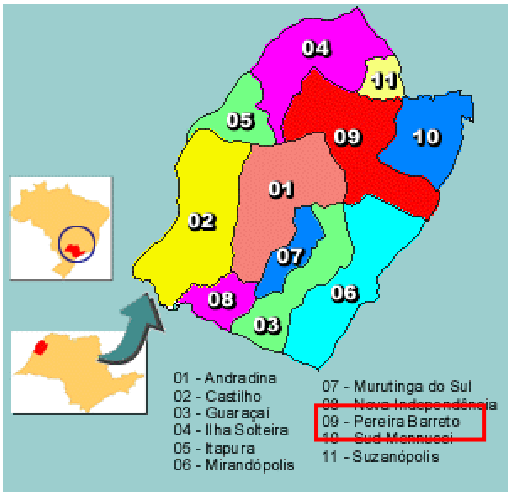
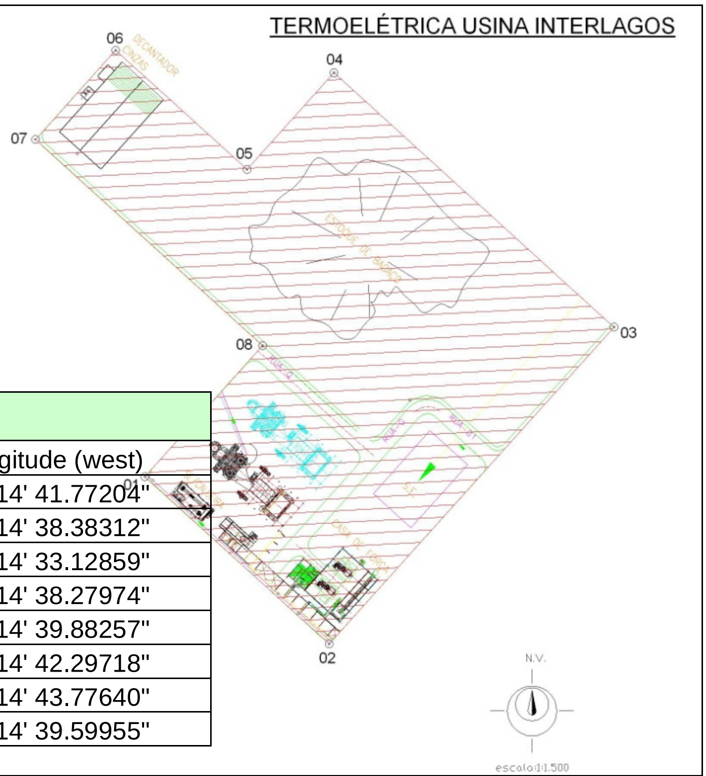


Figure 2: Political division of Brazil showing the state of São Paulo (Source: [Portal] Brasil, 2006) and the city involved in the project activity (Source: City Brazil, 2006).



Geographical Coordinates		
Point	Latitude (south)	Longitude (west)
01	20° 31' 47.28526"	51° 14' 41.77204"
02	20° 31' 50.17819"	51° 14' 38.38312"
03	20° 31' 44.71578"	51° 14' 33.12859"
04	20° 31' 40.31853"	51° 14' 38.27974"
05	20° 31' 41.98476"	51° 14' 39.88257"
06	20° 31' 39.92349"	51° 14' 42.29718"
07	20° 31' 41.46122"	51° 14' 43.77640"
08	20° 31' 45.02686"	51° 14' 39.59955"

A.4.2. Category(ies) of project activity:

Type: Energy and Power.

Sectoral Scope 1: Energy industries (renewable/non-renewable sources) Category: Renewable electricity generation for a grid (energy generation, supply, transmission and distribution).

A.4.3. Technology to be employed by the project activity:

The scenario existing prior to the start of the implementation of the project activity is a site where no power was generated.

Biomass power conversion technologies for power production can be classified into one of the three following categories: direct combustion technologies, gasification technologies, and pyrolysis. Direct combustion technologies, such as the used in Usina Interlagos, are probably the most widely known option for simultaneous power and heat generation from biomass. It involves the oxidation of biomass with excess air in a process that yields hot gases that are used to produce steam in boilers.

The steam is used to produce electricity in a Rankine cycle turbine (Figure 3). Rankine cycle configurations could also be classified into two: condensing and backpressure, depending on the proportion of the steam used for industrial processes and where in the turbine that steam is obtained. Typically, electricity only is produced in a "condensing" steam cycle, while electricity and steam are co-generated in an "extracting" steam cycle.

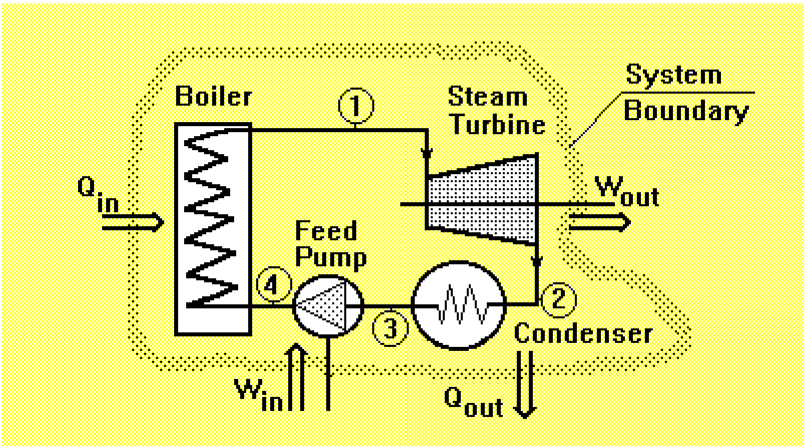


Figure 3 - Rankine Cycle

The project will start operating with a configuration using 1 boiler, 1 generator and 1 turbo-generator. In 2010, when the sugarcane production will increase more than the generator capacity, the installation of another generation plant of the same capacity and with the same configuration is planned. The equipments that are planned to be installed in the plant for the second phase of the project have the same characteristic as the ones of the first phase. It will displace energy from the grid by both avoiding the consumption of power from the grid in the project and by delivering clean energy to the grid. The power surplus in 2016 is predicted to be 219,567 MWh. This value may vary due to climate and crop conditions.

Table 2 - Technical Description of Energy Generation Equipments

	Boiler	*Turbo-reductor*	*Generator*

Quantity	1	1	1
Manufacturer	Caldema	TGM	WEG
Type	AMD-73-7GI	TME 35000 A	SPW 1250
Manufactured Year	2005	2006	2006
Pressure	67 bar abs	16 kgf/cm^2	
Temperature	480º C	320ºC	
Capacity	220 ton steam/h	40 MW	50 MVA
Frequency			1,800 rpm
Nominal Tension			13,8 kV
Lifetime	25 years (by regulation – ABNT NR13)	30 years	30 years
Efficiency	88.6 %	85.18 to 96.95 % (with 220 t/h steam flow)	Power Factor = 0.8: Load / Efficiency (%) 125 / 98.13 25 / 95.67 Power Factor =1.0 Load / Efficiency (%) 125 / 98.68 25 / 96.60

† Note: In the second phase it will be installed equipments with the same characteristics described in the above table.

The plausible baseline scenarios, as identified in section B.4, are: for power generation, P1 and P4 in conjunction with P5; for heat generation: the plausible baseline scenarios are H1 and H2; for biomass: the plausible baseline scenario is B4.

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

The chosen crediting period for this project is the renewable crediting period of 7 years. The estimated amount of emission reductions of the project can be seen at Table 3.

Table 3 – Estimated emission reductions for the first crediting period

Years	**Annual estimation of emission reductions in tonnes of CO_2**
2011 (from October 1)	5,844
2012	31,419

2013	33,737
2014	36,517
2015	44,421
2016	44,421
2017	44,421
2018 (until September 30)	35,011
Total Estimated Reductions (tonnes of CO_2e)	275,791
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	39,399

A.4.5. Public funding of the project activity:

There is no public funding involved on the Usina Interlagos Cogeneration Project. This project does not receive any public funding and it is not a diversion of Official Development Assistance (ODA) flows.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

ACM0006 - "Consolidated methodology for electricity generation from biomass residues in power and heat plants" (version 10.1, EB 55)

ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (version 12.1.0, EB 58)

This methodology is being used to calculate the emission factor for the electric system. ACM0002 recommends the use of the "*Tool to calculate the emission factor for an electricity system*", version 02, EB50. Therefore the tool will be used. For more details please refer to section B.6.1.

"Combined tool to identify the baseline scenario and demonstrate additionality", Version 2.2, EB28

"Tool for the demonstration and assessment of additionality", Version 5.2, EB39. (Section B.4 explains why this tool was also used in this project activity).

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

ACM0006 is applied to this project because it is a **greenfield power project**: a new biomass residue fired power and heat plant at a site where currently no power generation occurs.

It uses one type of biomass: bagasse, a byproduct of the production of sugar. The power generated by the project plant would in the absence of the project activity be purchased from the grid.

Applicability conditions of the methodology are as follows:

(i) *No other biomass types than biomass residues are used in the project plant and these biomass residues are the predominant fuel used in the project plant. Biomass residue is defined as a by-product, residue or waste stream from agriculture, forestry and related industries.*

The fuel used in the project plant is biomass residues consisting of sugar cane bagasse. The bagasse used in Usina Interlagos comes from the production of sugar carried in the same facility where the project is located.

(ii) *The implementation of the project shall not result in an increase of the processing capacity of raw input or other substantial changes in the process:*

Any increase in the bagasse production will be due to *Usina Interlagos* natural expanding business and cannot be attributed to the implementation of the cogeneration project. Usina Interlagos' main activity of Usina Interlagos is the alcohol production from sugarcane. The implantation of the sugarcane plantation was planned in 2003 to attend increasing market demand for alcohol. In February 2006 started the sugarcane seedling planting in an 8.2 km^2 area and will be gradually increased each year, up to 210 km^2 until 2010 for the first phase implementation. In a second phase plantation area will be expanded until reach 3.6 million ton of sugarcane.

As this is a Greenfield project, i.e., sugarcane plantation area is been prepared and developed, thus will be increased annually. Consequently the quantity of bagasse will also increase gradually.

Project Owner could fire all the exceed bagasse in the same boiler with very low efficiency, however, project owner decide to increase energy generation installing a new boiler-generator equipment.

To supply internal electricity consumption, a lower 15MW generation capacity, a lower pressure boiler (27 kgf/cm^2), and consequently lower efficiency is sufficient.

The Table below shows the classification of boilers accordingly to operation pressure.

Table 4 - Classification of boilers accordingly to operation pressure

Classification	Pressure (bar)	Steam Temperature
Very low pressure	under 6.9	1 bar – 100º C
Low pressure	6.9 to 13.8	13.8 bar - 187°C
Medium pressure	13.8 to 48.3	41.4 bar - 399°C
High pressure	48.3 to 103.4	103 bar - 510°C
Very high pressure	103.4 to 221.2	124 bar - 538°C
Supercritical	above 221.2	

References: Brazilian Service of Technical Answers, SENAI. 09 nov. 2006 (*in Portuguese*); Perry's Chemical Engineer's Handbook, 7th edition

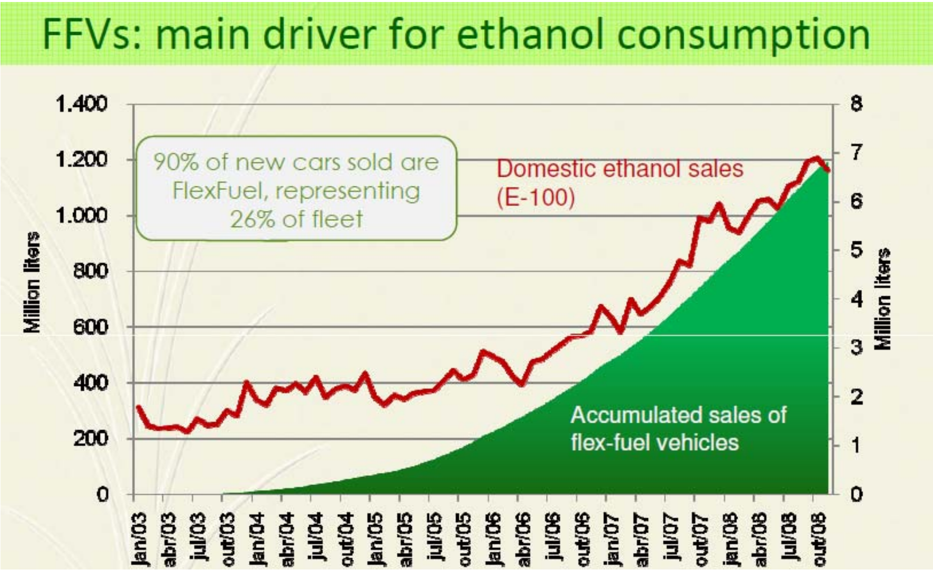
However, if there is no CDM project registration, Usina Interlagos will not implement the power plant expansion as there is no need to meet internal energy demand. The total generation capacity of one 40MW power plant in 203 days of harvest is around 194,000 MWh, which is 30% greater than the energy demand of the project in 2013, when the sugarcane production almost reaches the planned expansion of 3,600,000 ton.

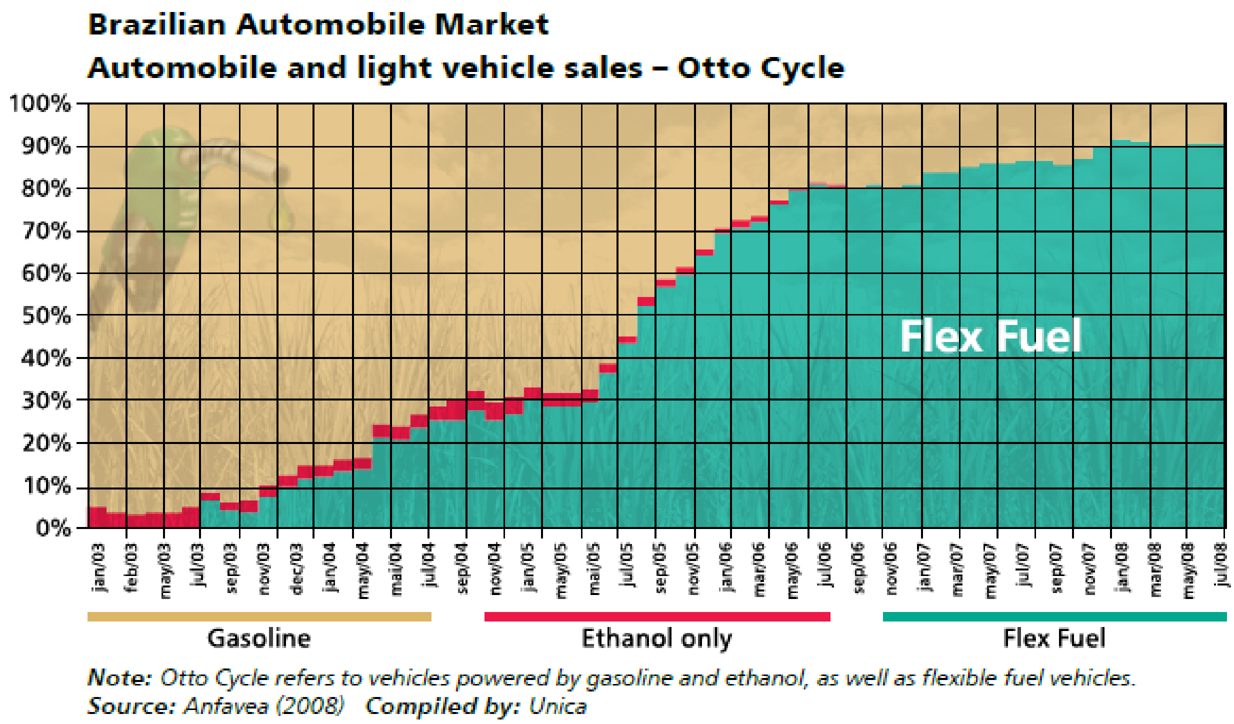
Any fluctuation of the amount of sugarcane produced and, consequently the bagasse will be due to climate, crop and market conditions that could vary from year to year.

Table 5 – Amount of sugar cane produced in Usina Interlagos

Harvest	Sugar cane processing (tonnes)
2009	2,070,000
2010	2,372,000
2011	2,613,000
2012	2,789,000
2013	3,000,000
2014	3,600,000
2015	3,600,000
2016	3,600,000
2017	3,600,000

Any future increase in biomass residues availability would be due to the natural expanding business (production increase of sugar and/or bioethanol). There has been a remarkable expansion of the ethanol market. In Brazil, the offer of ethanol supply cope with the rapid increasing demand caused by the use of flex-fuel vehicles (FFV), which can run on gasoline, ethanol or any blend of the two. This is shown by the figure below:





Source: Única – brochure "Sugarcane industry in Brazil" (http://www.unica.com.br/multimedia/publicacao/Default.asp?sqlPage=2) and presentation "Sugarcane in Brazil: The Sustainable Expansion" - World Biofuels Market Congress, 18/03/2009, Brussels

(iii) The biomass residues used by the project facility should not be stored for more than one year:

The sugar mills, generally, store a small amount of bagasse for the next season in order to start plant operations when the new crop season/ harvest begins. In Usina Interlagos, the bagasse will be stored from the end of the harvest season in the Brazilian Southeast region, in November, until the beginning of the following harvest season, in April. The volume of bagasse stored between seasons is foreseen to be insignificant, 10,000 ton - less than 4% of the total amount of bagasse generated during the year or during the harvest period.

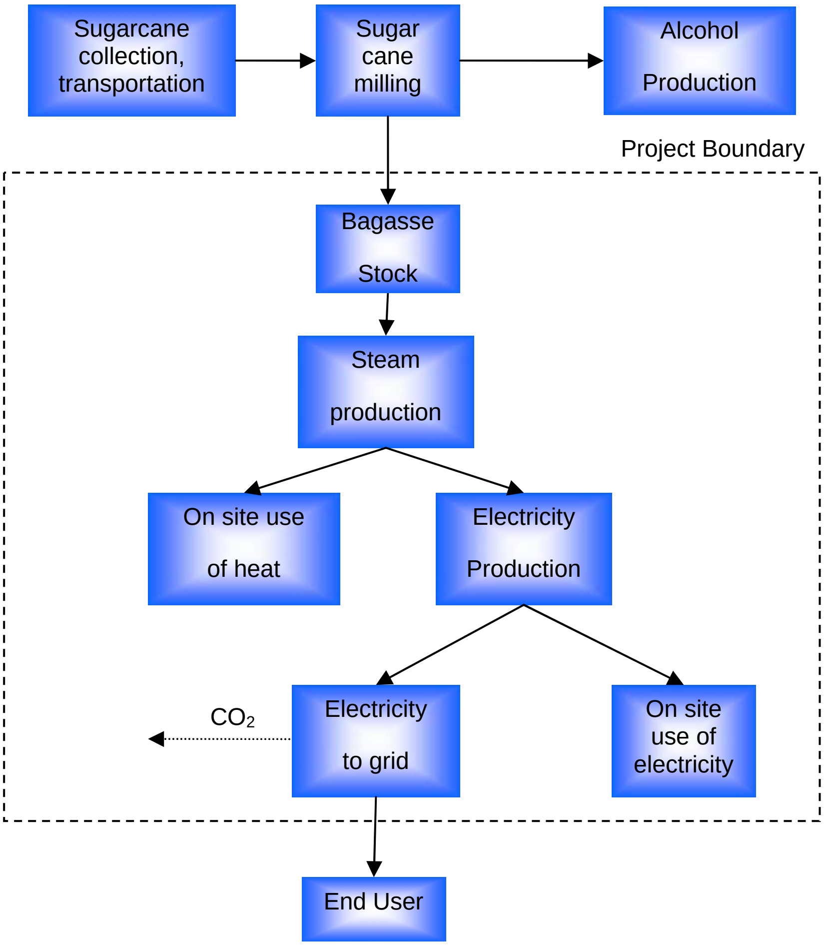
(iv) No significant energy quantities, except for transportation or mechanical treatment of the biomass residues, are required to prepare the biomass residues for fuel consumption:

The biomass used in this project is not transformed in any way before being used as a fuel.

Project boundaries

The project boundaries are defined by the emissions targeted or directly affected by the project activities, construction and operation.

The **spatial extent** of the project boundary encompasses the bagasse stocking area, the means for transportation of biomass from stock to power plant, the bagasse power plant at the project site and all power plants connected physically to the electricity system (interconnected grid) that the CDM project power plant is connected to. Please refer to Figure 4 to understand the project boundary and the activities included in it.



Monitored Variables

$EF_{grid,y}$ - CO2 emission factor for grid electricity during the year y

$BF_{k,y}$ - Quantity of biomass residue type k combusted in the project plant during the year y

NCV_k - Net calorific value of biomass residue type k

$EG_{project\ plant,y}$ - Net quantity of electricity generated in the project plant during year y

Moisture content of the biomass residues

Figure 4 – Usina Interlagos Cogeneration Project Boundary

B.3. Description of the sources and gases included in the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity generation	CO_2	Included	Main emission source.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.

	Heat generation	CO2	Excluded	Not accounted. Credits are not claimed for this emission source.
		CH4	Excluded	Excluded for simplification. This is conservative.
		N2O	Excluded	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass residues	CO_2	Excluded	It is assumed that CO2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative. Note also that emissions from natural decay of biomass are not included in GHG inventories as anthropogenic sources.[a]

Project Activity	On-site fossil fuel and electricity consumption due to the project activity (stationary or mobile)	CO_2	Excluded	There are no fossil fuel consumption nor electricity consumption due to the project activity.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.[c]
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.[c]
	Off-site transportation of biomass residues	CO_2	Excluded	There is no off-site transportation of biomass
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.[c]
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.[c]
	Combustion of biomass residues for electricity and/or heat generation	CO_2	Excluded	It is assumed that CO2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.[c]
	Storage of biomass residues	CO_2	Excluded	It is assumed that CO2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	Excluded for simplification. Since biomass residues are stored for not longer than one year, this emission source is assumed to be small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.[c]
	Waste water from treatment of biomass residues	CO_2	Excluded	It is assumed that CO2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	This emission source shall be included in cases where the waste water is treated (partly) under anaerobic conditions. This is not the case of Interlagos project.

		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be small.

Notes to table:

a. Note that the emission factors for CH_4 and N_2O emissions from uncontrolled burning or decay of dumped biomass are highly uncertain and depend on many site-specific factors. Quantification is difficult and may increase transaction costs significantly. Note also that CH_4 and N_2O emissions from the natural decay or uncontrolled burning are in some cases (e.g. natural decay of forest residues) not anthropogenic sources of emissions included in Annex A of the Kyoto Protocol and should not be included in the calculation of baseline emissions pursuant to paragraph 44 of the modalities and procedures for the CDM.

c. CH_4 and N_2O emission factors depend significantly on the technology (e.g. vehicle type) and may be difficult to determine for project participants. Exclusion of this emission source is not a conservative assumption; however, it appears reasonable, since CH_4 and N_2O from on-site use of fossil fuels and transportation are expected to be very small compared to overall emission reductions, and since it simplifies the determination of emission reductions significantly.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

ACM0006 version 10.1 requires that project participants shall identify the most plausible baseline scenario and demonstrate additionality using the latest approved version of the “Combined tool to identify the baseline scenario and demonstrate additionality”, agreed by the CDM Executive Board, available at the UNFCCC CDM web site.

In applying Step 1 of the tool, realistic and credible alternatives should be separately determined regarding:

• How **power** would be generated in the absence of the CDM project activity;

• What would happen to the **biomass residues** in the absence of the project activity; and

• In case of cogeneration projects: how the **heat** would be generated in the absence of the project activity.

Step 1: Identification of alternative scenarios

Step 1a: Define alternative scenarios to the proposed CDM project activity

According to the methodology there are different possible baseline scenarios for power, heat and biomass. The description of how these scenarios were analyzed is presented below.

POWER:

P1: *The proposed project activity not undertaken as a CDM project activity.*

This may be an alternative baseline scenario.

P2: *The continuation of power generation in an existing biomass residue fired power and heat plant at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as (co-)fired in the project activity.*

Excluded, because there is no power plant at the project site, as the project is the construction of a new plant.

P3: *The generation of power in an existing captive power and heat plant, using only fossil fuels*

Excluded, because neither there are plants nearby the project site, nor fossil fuels use by sugar mills in Brazil for power (or heat) generation.

This can be checked at the site of Unica (*União da Indústria de Cana- de-Açúcar* – Sugar Cane Industry Association).

This is cited from the site (http://bit.ly/a9YuxW):

“Auto-suficiência Energética: toda energia utilizada no processo industrial da produção de etanol e açúcar no Brasil é gerada dentro das próprias usinas a partir da queima do bagaço da cana”. (Energy self-sufficiency: all the energy used in the industrial process of ethanol and sugar production in Brazil is generated inside the mills, through the burning of sugarcane bagasse).

P4: *The generation of power in the* ***grid****.*

This may be an alternative baseline scenario.

P5: *The installation of a* ***new*** *biomass residue fired power and heat plant, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case.*

This may be an alternative baseline scenario.

P6: *The installation of a* ***new*** *biomass residue fired power and heat plant that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity. Therefore, the power output is the same as in the project case.*

Excluded, because the new plant would process the same amount – and not higher - of biomass residues as in the project activity - since the sugar mill core business is the production of sugar and ethanol, to which the production of biomass residues is related.

P7: *The* ***retrofitting*** *of an existing biomass residue fired power and heat plant, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g., an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case.*

Excluded, because there is no power plant at the project site, as the project is the construction of a new plant.

P8: *The* ***retrofitting*** *of an existing biomass residue fired power that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity.*

Excluded, because there is no power plant at the project site, as the project is the construction of a new plant.

P9: *The installation of a new fossil fuel fired captive power and heat plant at the project site.*

Excluded, because sugar mills in Brazil do not generate heat nor power burning fossil fuels. P10: The installation of a new single- (using only biomass residues) or co-fired (using a mix of biomass residues and fossil fuels) cogeneration plant with the same rated power capacity as the project activity power plant, but that is fired with a different type and/or quantity of fuels (biomass residues and/or fossil fuels). The annual amount of biomass residue used in the baseline scenario is lower than that used in the project activity. Excluded, because the baseline plant would not have the same rated power capacity as the project activity, since it would not export electricity to the grid.

P10: *The installation of a new single- (using only biomass residues) or co-fired (using a mix of biomass residues and fossil fuels) cogeneration plant with the same rated power capacity as the project activity power and heat plant, but that is fired with a different type and/or quantity of fuels (biomass residues and/or fossil fuels). The annual amount of biomass residue used in the baseline scenario is lower than that used in the project activity;*

Excluded, because the baseline plant would process the same amount – and not lower - of biomass residues as in the project activity - since the sugar mill core business is the production of sugar and ethanol, to which the production of biomass residues is related.

P11: *The generation of power in an existing fossil fuel fired cogeneration plant co-fired with biomass residues, at the project site.*

Excluded, because sugar mills in Brazil do not generate heat nor power burning fossil fuels.

Therefore, the plausible baseline scenarios for power generation are Alternatives P1 and P4 in conjunction with P5.

<u>HEAT</u>:

H1: *The proposed project activity not undertaken as a CDM project activity*

This may be an alternative baseline scenario.

H2: *The proposed project activity (installation of a power and heat plant), fired with the same type of biomass residues but with a different efficiency of heat generation (e.g. an efficiency that is common practice in the relevant industry sector).*

This may be an alternative baseline scenario

H3: *The generation of heat in an existing captive power and heat plant, using only fossil fuels*

Excluded, because neither are there other plants on-site (the project activity is the construction of a new plant) or nearby the project site, nor use sugar mills in Brazil fossil fuels for heat generation.

H4: *The generation of heat in boilers using the same type of biomass residues*

Excluded, because there were no boilers before the project activity, as the project activity is the construction of a new plant.

H5: *The continuation of heat generation in an existing biomass residue fired power and heat plants at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as in the project activity.*

Excluded, because there is no cogeneration plant at the project site, as the project is the construction of a new plant.

H6: *The generation of heat in boilers using fossil fuels*

Excluded, because sugar mills in Brazil do not use fossil fuels for heat generation.

H7: *The use of heat from external sources, such as district heat*

Excluded, because sugar mills in Brazil do not use heat from external sources.

H8: *Other heat generation technologies (e.g. heat pumps or solar energy)*

Excluded, because sugar mills in Brazil do not use other heat generation technologies.

H9: *The installation of a new single- (using only biomass residues) or co-fired (using a mix of biomass residues and fossil fuels) power and heat plant with the same rated power capacity as the project activity power and heat plant, but that is fired with a different type and/or quantity of fuels (biomass residues and/or fossil fuels). The annual amount of biomass residue used in the baseline scenario is lower than that used in the project activity.*

Excluded, because the baseline plant would have a lower (and not the same) power capacity, since it would not export electricity to the grid and would process exactly the same type and amount - and not higher - of biomass residues as in the project activity - since the sugar mill core business is the production of sugar and ethanol, to which the production of biomass residues is related.

H10: *The generation of power in an existing fossil fuel fired cogeneration plant co-fired with biomass residues, at the project site.*

Excluded, because sugar mills in Brazil do not generate heat nor power burning fossil fuels.

Therefore, the plausible baseline scenarios for heat generation are alternatives H1 and H2.

Biomass:

B1: *The biomass residues are dumped or left to decay under mainly aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields.*

Excluded, because sugar mills in Brazil use biomass residues for energy generation purposes, as shown above.

B2: *The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to deep landfills with more than 5 meters. This does not apply to biomass residues that are stock-piled or left to decay on fields.*

Excluded, because sugar mills in Brazil use biomass residues for energy generation purposes, as shown above.

B3: *The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes*.

Excluded, because sugar mills in Brazil use biomass residues for their energy generation purposes, as shown above.

B4: *The biomass residues are used for heat and/or electricity generation at the project site.*

This may be an alternative baseline scenario.

B5: *The biomass residues are used for power generation, including cogeneration, in other existing or new grid-connected power and heat plants.*

Excluded, because sugar mills in Brazil use biomass residues for their own energy generation, as shown above.

B6: *The biomass residues are used for heat generation in other existing or new boilers at other sites*

Excluded, because sugar mills in Brazil use biomass residues for their own energy generation, as shown above.

B7: *The biomass residues are used for other energy purposes, such as the generation of biofuels.*

Excluded, because sugar mills in Brazil use biomass residues for their own energy generation, as shown above.

B8: *The biomass residues are used for non-energy purposes, e.g. as fertilizer or as feedstock in processes (e.g. in the pulp and paper industry)*

Excluded, because sugar mills in Brazil use biomass residues for energy generation purposes, as a common practice, as shown above.

Therefore, the plausible baseline scenario for biomass residues is Alternative B4.

Outcome of Step 1a: From the above, the results can be summarized as follows:

- For power: P1 or P4 in conjunction with P5 are the plausible scenarios;
- For heat: H1 or H2 is the plausible scenario;
- For biomass: B4 is the only plausible scenario.

Sub-step 1b: Consistency with mandatory applicable laws and regulations

All the alternatives listed above are in compliance with the laws and regulations of the host country.

One of the alternatives for power generation (P4) is not under the control of project participants. In this case, the combined tool recommends that the "Tool for the demonstration and assessment of additionality" is used. For biomass, the scenario is B4. The combined tool will from now on be used only for the definition of the heat baseline scenario

Step 2: Barrier analysis

Sub-step 2a: Identify barriers that would prevent the implementation of alternative scenarios

No barriers that could prevent the above mentioned alternatives can be identified.

Outcome of Step 2a: none barriers can be listed.

Sub-step 2b: Eliminate alternative scenarios which are prevented by the identified barriers

The alternatives scenarios cannot be eliminated through the barrier analysis.

Outcome of Step 2b: none scenarios are eliminated.

The scenarios still under consideration are H1 and H2.

Step 3: Investment analysis

The financial indicator that will be used to conduct the investment analysis for the heat generation component is the cost of delivered heat in $/GJ.

According to the combined tool this analysis is suitable "*in the case that:*

(a) There are only two alternatives remaining after Step 2, which include the proposed CDM project activity and one other alternative,

(b) Both scenarios do not incur any revenue other than CDM related revenue or incur exactly the same revenue other than CDM related revenue and

(c) The project incurs costs and the other remaining alternative does not incur costs, then a simply cost analysis can be applied. In this case it is sufficient to document that the proposed project activity undertaken without being registered as a CDM project incurs costs".

The alternatives are:

H1: The proposed project activity not undertaken as a CDM project activity

H2: The proposed project activity (installation of a cogeneration power plant), fired with the same type of biomass residues but with a different efficiency of heat generation (e.g. an efficiency that is common practice in the relevant industry sector). This efficiency is lower than the one considered in the proposed project activity.

A boiler with a higher efficiency that would be used in scenario H1 is 25% more expensive than the one with lower efficiency that would be used in scenario H2, considering that both would have the same steam production capacity (information on prices provided by the Brazilian boiler manufacturer Dedini). In this way, there would be no sense to use a more expensive boiler, when there is no export of electricity (the combined tool asks for a separate analysis for the heat component), since the processes in the sugar mill use steam at low pressure.

In this sense, there won't be any revenues associated with the installation of a boiler of higher efficiency and considering it is more expensive, scenario H1 cannot be considered the most probable baseline scenario.

OUTCOME of Step 1

The combination of the alternatives identified above lead to:

1) Scenario: P1, H1 and B4. Project activity without CDM registration
2) Scenario: P4 + P5, H2, B4. Corresponds to scenarios 4, 13 or 18.

Scenario 13 is for the installation of a new biomass residue fired power plant, which is operated **next to (an) existing** biomass residue fired power plant, therefore is excluded; scenario 18 is for the **replacement** of an existing biomass residue fired power plant by a new biomass residue fired power plant, therefore also excluded.

Hence, the identified alternatives for the different components of the project activity correspond to **scenario 04**: installation of a new biomass residue fired power plant at a site where no power was generated prior to the implementation of the project activity

Interlagos Cogeneration Project uses bagasse for heat and electricity generation. The project activity is a new biomass power generation plant at a site where currently no power generation occurs. The power generated by the project plant would in the absence of the project activity be generated (a) in the reference plant and – since power generation is larger in the project plant than in the reference plant – (b) partly in power plants in the grid. The biomass residues are used for heat and/or electricity generation at the project site. In the absence of the project activity, the same quantity and type of biomass would be used in the reference plant. The heat generated by the project plant would, in the absence of the project activity, be generated by the reference plant, with a lower efficiency.

Emission reductions from heat are not considered because the thermal efficiency of the project plant is similar to the heat efficiency of the reference plant (a plant with a low-pressure boiler. According to Dedini, a Brazilian boiler manufacturer, the efficiency of a low-pressure boiler of 42 kgf/cm^2 is similar to the efficiency of a 66 kgf/cm2 boiler, while the efficiency of a low-pressure boiler of 21 kgf/cm^2 would be lower. Hence, for conservativeness reasons, the emission reductions from heat are excluded, i.e., $ER_{thermal,y}$ = 0.

For biomass the scenario is B4. For heat generation the baseline scenario is H2. For power generation, one of the remaining alternatives (P4) is not under the control of project participants. In this case, the combined tool recommends that the "Tool for the demonstration and assessment of additionality" is used. This analysis is provided in section B.5 below, and the baseline scenarios P4 and P5 were defined as the alternative scenarios.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality): >>

Project Timeline

Year 2005

29 April. Board Meeting, where the Interlagos cogeneration project with CDM carbon emissions reductions revenues was approved (evidence delivered to DOE)

30 April to 30 May: Global Stakeholders Process for a similar bagasse co-generation project, owned by Santa Adélia, same owner of the here described Interlagos project.

30 August: starting date of the Interlagos project activity. Date in which Interlagos issued the construction order of the main equipments (evidence delivered to DOE)

September: PIN issuance. Ecoinvest, which was the company that at that time was working with another CDM project developed by Santa Adélia (Registration Ref. Number 0200), prepared a Project Idea Note of Interlagos' Project (evidence delivered to DOE).

22 September 2005 – Issuance of civil construction works contract (evidence supplied to the DOE)

Year 2006

07 June: Signature of CDM consultancy contract with Ecoinvest Carbon Brasil (evidence delivered to DOE).

20 September: Construction License issued. Start on-site construction (evidence delivered to DOE).

13 October: DOE quotation for validation process (evidence: e-mail of the consultancy to the DOE and the proposal issued by TUV on 18/10/2006) (evidence delivered to DOE).

06 December: Start of first GSP of the Interlagos project

13-15 December: Validation site visit.

Year 2007

13 April: ANEEL[2] authorization nr. 1112 to start testing operations (publicly available at ANEEL's digital library, see http://www.aneel.gov.br/biblioteca/index.cfm).

31 May: ANEEL authorization number 1,694 to start full operation (publicly available at ANEEL's digital library).

01 June: Issuance of the 1st validation report: 1st June, 2007.

05 June: Project submission to Brazilian DNA: 5th June, 2007 – available at the Brazilian DNA website http://www.mct.gov.br/index.php/content/view/60853.html

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[2] Brazilian Electricity Regulatory Agency (from the Portuguese "Agencia Nacional de Energia Elétrica")

10 August: Brazilian DNA revision request includes revision of the Emission Factor calculation to use separated sub-grids.

From August 2007 to May 2008, Brazilian CDM developers worked together to discuss with the Brazilian DNA about the emission factor grid/sub-grid as well as operating margin calculation method. During this period, the Interlagos project was paused.

06 November: Second GSP starting day. Due to the review of the originally used version of methodology ACM0006 and the inclusion of the Tool to calculate the emission factor for an electricity system into the ACM0002, project participants decided to review the PDD and start a new GSP.

Year 2008

30 May. Brazilian DNA approved the project with corrections, excluding the requirement to change the grid/sub-grid separation to the emission factor calculation. The only correction required is the update of methodology version and correspondent validation report. (Evidence delivered to DOE)

After the DNA approval of the grid emission factor, PPs re-started the validation process, updating the emission factor using most recent available data.

15 August. DOE issued the Validation Protocol.

28 August. Request for clarification (AM_CLA_0120) sent to Meth Panel, regarding the applicability of the "Combined tool to identify the baseline scenario and demonstrate additionality".

7 November. Response for the request of clarification received from Meth Panel, allowing the use of the Tool instead of the Combined Tool, under deviation request.

5 December. PPs send to DOE document concerning the Request for deviation.

Assessment and Demonstration of Additionality

Methodologies using the combined tool are only applicable if all potential alternative scenarios to the proposed project activity are available options to project participants. For grid-connected power projects, such as this, an alternative is the electricity production by other facilities. This alternative is not under the control of project participants.

In those cases, according to the "*Combined tool to identify the baseline scenario and demonstrate additionality*", a different procedure is required to demonstrate additionality and identify the baseline scenario: methodologies that involve alternatives which are not under the control of project participants can continue to use the additionality tool[3]. This was done in this Project

Hence, the "Tool for the demonstration and assessment of additionality", version 5.2, will be used in order to determine if the project activity is additional. The following steps are applied:

Step 1. Identification of alternatives to the project activity consistent with the current laws and regulations

Sub-step 1a. Define alternatives to the project activity

[3] A request for clarification was made to ensure the possibility of the use of the Tool instead of the Combined Tool; and the answer: F-CDM-AM-Clar_Resp_ver 01.1 - AM_CLA_0120, was positive to use the Tool, since a request for deviation is submitted. PP requested the deviation through TUV-SUD.

To define the alternatives to the project activity, there are two-sided analysis, taking into consideration the perspective of the project owner and the perspective of the country.

From the project owner's perspective, the cogeneration project allows the company to export electricity to the grid. Without the project, as seen from the alternative scenarios analysis above, the plant would operate with low energy efficiency, not exporting electricity to the grid. Hence, the alternatives to the project activity are:

- 1) the power generated by the project plant would, in the absence of the project activity, be generated (a) in the reference plant (alternative P5) and – since power generation is larger in the project plant than in the reference plant – (b) partly in power plants in the grid (alternative P4).
- 2) The project activity implemented without been registered as a CDM project activity (P1).

From the country's perspective, the alternative for producing a similar amount of energy, as the one Interlagos is to provide, would be to use current generation system, which is electricity supplied by large hydro and thermal power stations. Brazil is increasingly depending on thermal plants. In the most recent energy auctions in Brazil, the results were the following: in an auction which took place on July 26, 2007, there was in an increase of 1,781.8 MW into National Electric System, all of them from oil thermo plants[4]; in an auction which took place on October 16, 2007, there was in an increase of 4,353 MW into National Electric System, from which 69% originated from fossil fuel (oil, coal and natural gas) plants[5].

During a period of restructuring the entire electricity market, as is the current Brazilian situation, investment uncertainty is the main barrier for small renewable energy power projects. In this scenario, these projects compete with existing plants and with new projects, in which thermal plants usually attract the attention of financial investors.

Sub-step 1b. Consistency with mandatory laws and regulations

The usage of electricity from the grid is in complete compliance with all applicable legal and regulatory requirements. The use of thermal electricity in the generation system is not only in compliance with regulations but also of increasing importance. The proposed project activity is not the only alternative in compliance with regulations.

The following analysis will study the viability of the implementation of the project without being registered as a CDM project activity.

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method

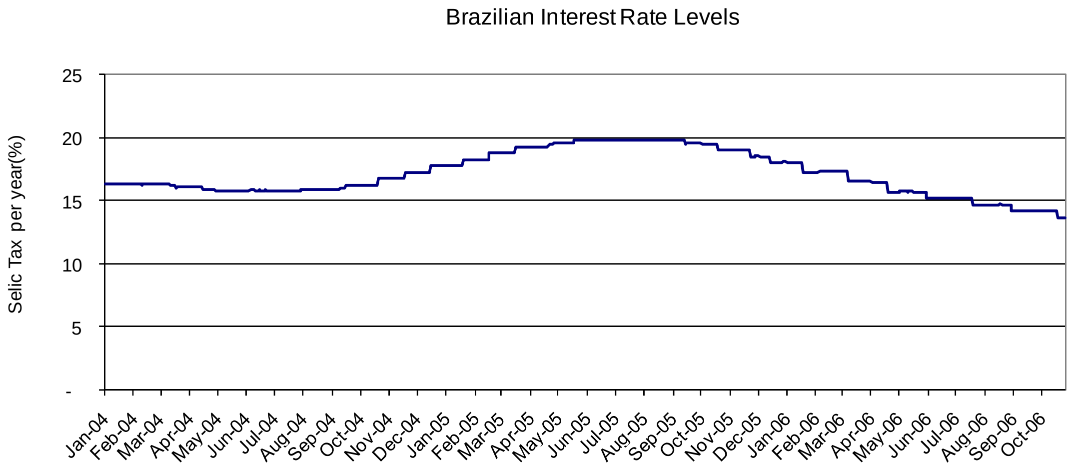
Additionality is demonstrated through an investment benchmark analysis (option III)

Sub-step 2b and 2c– Option III - benchmark analysis

Santa Adélia has another registered CDM Project Activity (Termoelétrica Santa Adélia Cogeneration Project (TSACP) – Project Ref. Nr. 0200). The additionality of this project activity was

[4] Source: http://www.epe.gov.br/Lists/LeilaoA32007/DispForm.aspx?ID=44
[5] Source: Folha de S. Paulo, 17/10/2007, http://www1.folha.uol.com.br/fsp/dinheiro/fi1710200730.htm

demonstrated trough the barrier analysis, however, a comparison between the Project's IRR and the SELIC[6] rate was carried out in order to analyze accurately the investment environment in Brazil. To be consistent with the analyses of the project that was previously registered the Brazilian Prime Rate, known, as SELIC rate, will be taken into account to give an indication of the investment environment and general investment expectation in the country. At the time of investment decision, April/2005, Selic rate was at 18.74% (March/2005). Weighted Average Cost of Capital (WACC) applicable to power generation is calculated at the time of the investment decision, 14.44% (spreadsheet with calculation is supplied as annex of the present document). The calculated WACC, being a more specific and, incidentally, a more conservative figure, is applied in the benchmark analysis.



(Reference: Central Bank of Brazil)

Financial Indicator, Internal rate of return (IRR)

Financial indicator identified for cogeneration project as the case of Interlagos is the project IRR.

Interlagos' cash flow for 20 years (see annexed spreadsheet with the free cash flow analysis of the project activity) shows that the IRR of the project, 12.16% is lower than the chosen benchmark, the WACC of power generation in Brazil of 14.44%. This evidences that project activity is not financially attractive to investor.

The cash flow revenues and costs future increase estimation are not linear because are directly linked with the plantation area, which in time are based on the sugarcane plantation area expansion, which is not linear, but depends on the negotiation of the area with the property owners. The figure below shows the assumed and calculated values up to 2014 (for the remaining analysis up to 2026 the figures of 2014 are repeated, see PDD annex with the IRR calculation for details). Electricity generation in the cash flow was based on annexed spreadsheet with the CERs calculation. Tariff values were estimated at BRL 125/MWh, based on the results of the first new electricity tender, carried out by the Brazilian Federal Government in 2005[7]. The prices varied from BRL 111.04 to be dispatched in 2008 up to BRL 138.85 to be dispatched in 2010. PPA signed with CEMIG in 2006, which was chosen because it is a long-term contract, with value of BRL 124.90/MWh, is submitted to the DOE to confirm the consistency of the figure. Tax values in the cash

[6] http://www.portalbrasil.net/indices_selic.htm
[7] Results available at http://bit.ly/h7kewU.

flow are based on the following Brazilian laws: PIS- Law 10.637, COFINS - Law 10.833, IR - Law 9.430, CSLL - Law 7.689. Applicable depreciation rates for each piece of equipment are determined by the Secretariat of the Federal Revenue[8]. In the IRR calculation the most conservative individual value (5%) was used. Total investment (BRL 100.8 million) and O&M costs (3.567%% of investment costs) were estimated by the project participants, and confirmed to be plausible and conservative by means of official indicative figures[9,10] available at the time of the decision to proceed with the project activity.

According the PDD guidelines (version 7), the document has to "explain and justify key assumptions and rationales. Provide relevant documentation or references. Illustrate in a transparent manner all data used to assess the additionality of the project activity (variables, parameters, data sources etc)." The project participants call the attention to the fact that the supplied calculation spreadsheets (CERS, WACC and IRR) are part of the present PDD. Key assumptions and rationales are provided in the paragraphs above and in the annexed spreadsheets. Relevant documentation and references are disclosed in the spreadsheets and were provided to the DOE.

Sub-step 2d: Sensitivity analysis

A sensitivity analysis was conducted by altering the following parameters:

• Increase in project revenue (tariff and PLF)

• Reduction in costs (O&M and total investment)

Those parameters were selected as being the most likely to fluctuate over time. Financial analyses were performed altering each of these parameters by 10%, and assessing what the impact on the project IRR would be. See results in the Table below (for the calculation, see annexed free cash flow spreadsheet).

Table: Sensitivity analysis

Scenario	**% change**	**IRR (%)**
Original	-	12.16
Increase in tariff value	10%	13.68
Increase in power generation	10%	13.68
Reduction in project operational costs	10%	12.44
Reduction in investments costs	10%	13.84
Benchmark: Sector WACC		14.44%

As it can be seen, the project IRR remains lower than the benchmark even in the case where these parameters change in favor of the project. Yet, a simulation was conducted in order to verify possible scenarios where the IRR would equal the benchmark (Table 6).

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[8] Regulation 162/1998 available at http://bit.ly/idia5I.

[9] **Ministério das Minas e Energia (2003)**. *Valor Econômico da Tecnologia Específica da Fonte (VETEF) – Programa de Incentivo às Fontes Alternativas de Energia Elétrica (PROINFA, 1ª Etapa).*

[10] **Centro Nacional de Referência em Biomassa (2001)**. *Levantamento do Potencial Real de Cogeração de Excedentes no Setor Sucroalcooleiro.* In the reference investment costs in the range of BRL 1500 to BRL 2000 per kW are estimated for project activities aiming to generate additional electricity to be dispatched into the grid in the sugarcane sector with similar configuration (60 bar and 450°C boiler, options 3 and 4 in the reference). The conservative value of BRL 1260/kW was estimated for the project activity.

Table 6 – Scenarios when IRR of the project equals the benchmark (14.44%).

	IRR %	*O&M COST* (1,000BRL/MWh)	*Investment* (1,000BRL/MWh)	*Tariff* (BRL/MWh)	*PLF**	*Variation* (%)
Original	12.16	3,595	100,797	125.00	218,052	N/A
O&M Costs	14.44	629	100,797	125.00	218,052	-82.50
Investment	14.44	3,595	87,492	125.00	218,052	-13.20
Tariff	14.44	3,595	100,797	143.94	218,052	+15.15
PLF	14.44	3,595	100,797	125.00	251,087	+15.15

** These values are valid from 2014 on.*

An increase in the price would result in a project IRR equal to the benchmark if readjusted to BRL143.94/MWh. This corresponds to a variation of 15.15% from the original price considered (BRL125.00/MWh). In the other hand, the project's IRR would equal the benchmark in the scenario where 251,087MWh/yr is exported by the plant to the grid (originally, the plant was planned to export 218,052MWh). This variation also corresponds to an increase in the electricity generation equivalent to 15.15%.

The price used in the analysis (BRL125.00/MWh) was taken from the results of the first new electricity public auction conducted by the Chamber of Electrical Energy Commercialization (CCEE – *Câmara de Comercialização de Energia Elétrica*). According to CCEE *the criterion of the least tariff is used to define the winners of a given auction, that is, the winners of the auction shall be those bidders which offer electric power for the least price per Mega-Watt Hour to supply the demand envisaged by the Distributors*.

The result of a successful participation in this kind of public auction is the signature of a Power Purchase Agreement called CCEAR – Contract on Energy Commercialization in Regulated Market[11]. PPAs remain fixed throughout the years, and are only be adjusted accordingly to the Amplified Consumers Price Index (from the Portuguese *Índice de Preços ao Consumidor Amipliado*), which is the official index that measures the inflation in Brazil. Since the cash flow was done without considering any variation due to inflation over the considered years, the tariff shall also be kept in constant values. In addition, due to the long term of the PPA, it is reasonable to assume that the tariff will not change.

Besides, a comparison between the tariff applied to the analyses and the ones obtained for sugar mills in the most two recent auctions can be made. The 8th New Energy Auction[12] took place in August 2009. The sugar mill that sold the surplus of its electricity in this auction obtained a tariff of BRL144.60/MWh. This

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[11] According to CCEE *the new model for the electric sector states that the commercialization of electric power is accomplished in two market ambiences: the Regulated Contracting Ambience – ACR (Ambiente de Contratação Regulada) and the Free Contracting Ambience –ACL (Ambiente de Contratação Livre). Contracting in the ACR is formalized by means of regulated, bilateral agreements, called Electric Power Commercialization Agreements within the Regulated Ambience (CCEAR – Contratos de Comercialização de Energia Elétrica no Ambiente Regulado) entered into between Selling Agents (sellers, generators, independent producers or self-producers) and Purchasing Agents (distributors) which participate of electric power purchase and sale auctions.*

[12] The results of the 8th New Energy Auction are publicly available at <http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=39c02d85c2753210VgnVCM1000005e01010aRCRD>. Accessed on 04 May 2011.

tariff as of December 2005 is equivalent[13] to BRL112.28/MWh. The 2nd Alternative Source Auction[14] was conducted on August, 2010. The tariff obtained by the sugar mill that sold electricity in this auction was BRL137.92/MWh. This tariff, as of December 2005 would be equivalent[12] to BRL114.58/MWh. As it can be observed, the tariffs of both auctions are lower than the one used in the analysis, which as a consequence, can be deemed conservative and appropriated. Hence, no variation in the project IRR can be expected to be associated to a possible increase in the price of electricity.

The electricity generation is not expected to rise because the estimative was based on the sugar cane processing capacity of the plant. Therefore, the plant could only generate more electricity than the one estimated and used in the analysis if the processing capacity of the sugar mill is increased. This is not forecasted by the project owner. Additionally, this expansion would also incur in new investments, consequently decreasing the impact in the IRR of the project. Therefore, an increase in project revenues due to an increase in the electricity generation above the assumption presented in the cash-flow is not probable.

The total investment necessary to build the plant as it is presented in the cash flow corresponds to the estimated investment cost made by the project owner. As discussed above (see financial indicator calculation), two supplied official documents available at the time of investment decision indicate additional investment costs for project aiming to generate electricity to be dispatched into the grid in the sugar and alcohol industry in Brazil: CENBIO (2001)[10] and MME (2003)[9]. Unicamp (2008)[15] indicates investment costs in the range of BRL 1850 to 2000 per kW. Therefore, the estimated value of BRL 1260/kW for the project activity is clearly plausible and conservative. Moreover, real data demonstrate that the actual value is already bigger. In summary, no variation in the project IRR can be attributed to a variation in the investment costs.

Finally, a decrease in the Operating and Maintenance (O&M) costs is not expected. Literature shows that the value applied is already conservative. The value applied (3.567% of the investment cost) was informed Brazilian Mines and Energy Ministry in federal government economic reference note from 2003[9]. Unicamp (2008)[15] indicates O&M costs corresponding to 4% of the investment costs which is similar to the value used and also indicates the suitability of the value. Therefore, such a huge variation of the O&M costs is not expected to occur.

Outcome: The IRR of the project activity without being registered as a CDM project (12.16%) is notably below the sector benchmark (14.44%) evidencing that project activity is not financially attractive to investor

Step 3. Barrier Analysis:

Sub-step 3a. Identify barriers that would prevent the implementation of the proposed CDM project activity

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[13] Tariff obtained by sugar mills in the most tow recent auctions was deflated considering the IGP-M index. The historical data of this index is publicly available at < http://www.ipeadata.gov.br/Default.aspx#>. Accessed on 04 May 2011.

[14] The results of the 2nd Alternative Source Auction are publicly available at <http://www.ccee.org.br/cceeinterdsm/v/index.jsp?contentType=RESULTADO_LEILAO&vgnextoid=ed7c645eb56ba210VgnVCM1000005e01010aRCRD&qryRESULTADO-LEILAO-CD-RESULTADO-LEILAO=5710645eb56ba210VgnVCM1000005e01010a____&x=16&y=5>. Accessed on 04 May 2011.

[15] **Universidade Estadual de Campinas (2008)**. Avaliação técnico-econômica de opções para o aproveitamento integral de biomassa de cana no Brasil. PhD thesis by Mr. Joaquim Eugênio Abel Seabra.

The barriers mentioned below serve to reinforce the conservativeness of the adopted benchmark, which should be higher to reflect these difficulties.

Institutional Barriers

An article written in 2004 by two professors of Energy Planning at the Universidade Federal do Rio de Janeiro analyzes Brazilian energy regulations and identifies four fragilities that can undermine their suitable implementation. Those fragilities refer to:

1) The guarantee of the purchase of electricity. Some points are still to be clarified, regarding:
   a) Minimum and maximum limits for the purchase of energy;
   b) the possibility of the ONS - Electrical System Operator to determine production increase or decrease, depending on the demand variation;
   c) Payment for the availability of production capacity, in periods when there is abundant energy offer.
2) Juridical problems in the public calls legislation. Some rules are not totally compatible with the legislation, which might even lead to contract annulations.
3) The way the energy price is presently established, through the calculation of an average price for each type of energy source, penalizes projects with a lower cost-benefit rate. The authors suggest that the prices should be set according to the characteristics of each project.

Link to this article (with an abstract in English): http://bit.ly/bPJ766.

There is a rising demand for energy in Brazil, but it is not being attended by biomass plants. In the most recent energy auctions in Brazil, the results were the following: in an auction which took place on July 26, 2007, there was in an increase of 1,781.8 MW into National Electric System, entirely from oil thermo plants[16]; in an auction which took place on October 16, 2007, there was in an increase of 4,353 MW into National Electric System, from which 69% originated from fossil fuel (oil, coal and natural gas) plants[17].

In the energy auction for alternative energy sources, which took place on June 18, 2007, 2,803 MW were qualified, but only 638,64 MW were negotiated[18], which shows the lack of interest by most of the participants, due to the price and conditions presented. From the estimated 2,000 to 3,000 MW available from sugarcane bagasse plants, only 542 MW were sold. As mentioned above, in August 2008, the auction for “reserve energy”, which included only biomass as an energy source, had results below expectation: 2,102 average MW were eligible to participate, but only 548 MW were negotiated in the auction. The main reason for this, according to market analysts, was the low price achieved.

Due to the barriers mentioned above, which are still valid in 2009, the generation of electrical energy from sugarcane bagasse represents only 3.83% of the total generation of electricity in Brazil (see table below).

[16] Source: http://www.epe.gov.br/Lists/LeilaoA32007/DispForm.aspx?ID=44
[17] Source: Folha de S. Paulo, 17/10/2007, http://www1.folha.uol.com.br/fsp/dinheiro/fi1710200730.htm
[18] Source: http://www.epe.gov.br/PressReleases/20070618_1.pdf

Type		Installed Capacity Number of plants	Installed Capacity (kW)	%	Total Number of plants	Total (kW)	%
Hydro		814	78,213,049	68.74	814	78,213,049	68.74
Gas	Natural	91	10,605,802	9.32			
	Processed	32	1,246,483	1.1	123	11,852,285	10.42
Oil	Diesel	777	3,894,983	3.42			
	Residual	21	1,711,194	1.5	798	5,606,177	4.93
Biomass	Sugarcane bagasse	278	4,358,370	3.83			
	Black Liquor	14	1,145,798	1.01			
	Wood	33	295,017	0.26			
	Biogas	7	41,842	0.04			
	Rice residues	7	31,408	0.03	339	5,872,435	5.16
Nuclear		2	2,007,000	1.76	2	2,007,000	1.76
Coal	Mineral coal	8	1,455,104	1.28	8	1,455,104	1.28
Wind		36	602,284	0.53	36	602,284	0.53
Imports	Paraguai		5,650,000	5.46			
	Argentina		2,250,000	2.17			
	Venezuela		200,000	0.19			
	Uruguai		70,000	0.07		8,170,000	7.18
	Total	2,120	113,778,334	100	2,120	113,778,334	100

Operating Plants, as of 19/10/2009

Source: http://www.aneel.gov.br/aplicacoes/capacidadebrasil/OperacaoCapacidadeBrasil.asp

This trend is due to continue, as shown by the huge difference between biomass thermal plants and fossil fuel plants power capacity granted by ANEEL, as of 19/10/2009:

Class of fuels used in Brazil - Grants			
Fuel	Quantity	Power (kW)	%
Biomass	49	1,997,220	15.81
Fossil	94	10,590,202	83.81
Others	9	49,100	0.39
Total	152	12,636,522	100

Sources of energy to generate electricity – Grants (as of 19/10/2009 - http://www.aneel.gov.br/aplicacoes/capacidadebrasil/Combustivel.asp)

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed activity):

As described above, the main alternative to the project activity is to continue the status quo, the sugarcane mills only concentrating their investments on sugar and ethanol. Therefore the barriers above have not affected the investment in other opportunities

Both sub-steps 3a-3b are satisfied, proceed to Step 4.

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity:

An article by Marcos Sawaya Jank, president of Unica (Sugarcane Industry Association), published on 17/11/2009, states that only 20% of Brazilian sugar mills export electricity to the grid (source: http://bit.ly/eljWu9).

Generation of electricity by sugar mills for the grid cannot be considered common practice in Brazil, where only 3.83% of the installed capacity consists of sugarcane bagasse generation[19] (most of this for sugar mills own consumption and operation only in the harvest season. In other words, if one wants to consider electricity supplied to the grid, the share is considerably smaller).

The potential to generate electricity for commercialization (exporting to the grid), is estimated at around 8.7 GW, for 2012-2013[20]. This potential has always existed and has grown as the sugarcane industry has grown. However, investments to expand the sugar mills' power plants have only occurred since 2000. Although flexible legislation allowing independent energy producers has existed since 1995, it was only after 2000 that sugar producers started to study this proposed project activity as an investment alternative for their power plants in conjunction with the introduction of the CDM.

Copersucar is one of the biggest cooperatives of the sector in Brazil (*Jornal da Cana* – Sugarcane branch newspaper, October, 2006). Among Copersucar member plants, considering the plants that do not have CDM projects, only 10% have increased their capacity in order to export energy to the grid in 2006[21].

The Interlagos project is in the state of São Paulo, which is the state with the highest number of mills which export electricity.

A comparison of Interlagos' electrical efficiency will be made with the sugar mills which are Copersucar members, but not CDM projects. Financial data about these sugar mills is not publicly available. Hence, only a technical comparison can be made.

Interlagos has a ratio *total generated KWh/tones of bagasse* of 380.6. Among Copersucar members, the average ratio of *total generated KWh/tones of bagasse is* 50.0.

A list of sugar mills, which are present in the Brazilian Electricity Regulatory Agency database of power generation with biomass[19] with an installed capacity over 50 MW (the total capacity of Interlagos is 80MW – the *Tool of Additionality* recommends the comparison of projects with similar scale), is presented below.

The region selected for the common practice analysis is the state of São Paulo, where Interlagos plant is located, and where most of the mills with similar scale are located, as shown below. Additionally, 61% of the mills which export to the grid are located in São Paulo (source: http://bit.ly/eljWu9).It is important to call the attention to the fact that the environmental licensing process is regulated and carried out by the local state

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[19] ANNEL, Banco de Informações da Geração (http://www.aneel.gov.br/aplicacoes/capacidadebrasil/OperacaoCapacidadeBrasil.asp, accessed on 12/05/2009),

[20] UNICA - *União da Indústria de Cana-de-Açúcar* – Union of the Sugarcane Industry (www.portalunica.com.br)

[21] Copersucar - Cooperativa Produtores de Cana-de-açúcar, Açúcar e Álcool do Estado de São Paulo (São Paulo State Sugarcane, sugar and alcohol producers cooperatives). Data available only to cooperative members. Similar information can be also assessed in the article "*Usinas aproveitam co-geração e lucram com créditos de carbono*" available at: http://www.seagri.ba.gov.br/noticias.asp?qact=view&notid=8143

environmental agency. Another evidence of the difference is that even where federal regulation has to be followed, for example, the federal tax for the use of the interconnected distribution and transmission system, its value is ultimately determined by the state where the power generation project is located[22]. Therefore, only projects in the state of Sao Paulo can be considered to take place in a comparable environment with respect to regulatory framework. Taking into account the above, i.e., sugarcane-bagasse-fired thermoelectric power plants, in the state of Sao Paulo and with installed capacity above 50MW, the following is the most recent official and publicly available list of similar projects.

	Termoelectric power plants in the state of Sao Paulo, dispatching into the grid and firing sugarcane bagasse (above 50 MW capacity)					Boiler pressure (bar)
	Usina	Installed capacity (kW)	Location			
1	Rafard	50,000	Rafard - SP	PAC*	CDM	62
2	Colorado	52,760	Guaíra - SP	PAC*	CDM	66
3	Guaíra Energética	55,000	Guaíra - SP		CDM	66
4	Santa Elisa - Unidade I	58,000	Sertãozinho - SP		CDM	66
5	Equipav	58,400	Promissão - SP		CDM	66
6	Alta Mogiana	56,000	São Joaquim da Barra - SP		CDM	42
7	Conquista do Pontal	100,000	Mirante do Paranapanema - SP	PAC*		67
8	Barra Grande de Lençóis	62,900	Lençóis Paulista - SP		CDM	65
9	Colombo	65,500	Ariranha - SP		CDM	62
10	Barra Bioenergia	136,000	Barra Bonita - SP	PAC*		100
11	Ferrari	65,500	Pirassununga - SP	PAC*	CDM	65
12	São Luiz	70,400	Pirassununga - SP		CDM	67
13	Cerradinho	75,000	Catanduva - SP		CDM	62
14	Costa Pinto	75,000	Piracicaba - SP	PAC*	CDM	67
15	São João da Boa Vista	77,000	São João da Boa Vista - SP	PAC*	CDM	67
16	Cocal II	160,000	Narandiba - SP	PAC*		67
17	Equipav II	80,000	Promissão - SP		CDM	66
18	Gasa	82,000	Andradina - SP		CDM	67
19	São José	80,300	Macatuba - SP	PAC*	CDM	42
20	Santa Cruz AB (ExOmetto)	84,000	Américo Brasiliense - SP	PAC*	CDM	65
21	Vale do Rosário	93,000	Morro Agudo - SP		CDM	65
22	Usina Bonfim	111,000	Guariba - SP	PAC*	CDM	100

From the 22 similar projects, 19 are project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process (complete references in the PDD “similar projects” annexed spreadsheet) and will not be included in the analysis (EB38, paragraph 60). The remaining 3 projects (Conquista do Pontal, Barra Bioenergia abd Cocal II, are part of the federal government PAC program23 , receiving additional financial incentives[24] and, therefore, cannot be consider to take place in a comparable environment with respect to investment conditions. Another evidence to demonstrate the federal government involvement is the fact that all three projects were inaugurated simultaneously in September 2010[25], Barra Bioenergia by the Brazilian President, Mr. Luiz Inacio Lula da Silva, Cocal II by the Ministry of Mines and Energy, Mr. Marcio Pereira Zimmermann and, finally, Conquista do Pontal by the Electricity Secretary of the Ministry of Mines and Energy, Mr. Wilson Grudtner.

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[22] ANEEL, Resolucao Homologatoria 445, 03/04/2007 (submitted to the DOE).
[23] Programa de Aceleraçao do Crescimento (Growth Acceleration Program, see http://www.brasil.gov.br/pac and a list of power plants included in the program in the report available at http://www.brasil.gov.br/pac/pac-2/pac-2-relatorio-5).
[24] For example, higher Debt to equity rate, longer grace period, etc. (see technical note published by DIEESE, Inter-Union Department of Statistics and Socio-Economic Studies, available at http://bit.ly/fdTtJ6 or the official government reference at http://bit.ly/edqp9y).
[25] Source: http://www.jcnet.com.br/mostra_fotocapa.php?codigo=3276.

In this way, no similar project is taking place, stressing the fact that the Interlagos project is not the common practice.

Sub-step 4b. Discuss any similar options that are occurring:

As shown above, there is a rising demand for energy in Brazil, but it is not being attended by biomass plants. In the most recent energy auctions in Brazil, the results were the following: in an auction which took place on July 26, 2007, there was in an increase of 1,781.8 MW into National Electric System, all of them from oil thermo plants[26]; in an auction which took place on October 16, 2007, there was in an increase of 4,353 MW into National Electric System, from which 69% originated from fossil fuel (oil, coal and natural gas) plants[27].

In the energy auction for alternative energy sources, that took place on June 18, 2007, 2,803 MW were qualified, but only 638.64 MW were negotiated[28], what shows the lack of interest by most of the participants, due to the price and conditions presented. From the estimated 2,000 to 3,000 MW available from sugarcane bagasse plants, only 542 MW were sold. As mentioned above, in August 2008, the auction for “reserve energy”, which included only biomass as energy source, had results below expectation: 2,102 average MW were eligible to participate, but only 548 MW were negotiated in the auction.

This situation stresses that the project activity shall not be considered as common practice.

Sub-steps 4a and 4b are satisfied, and then the proposed project activity is additional.

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[26] Source: http://www.epe.gov.br/Lists/LeilaoA32007/DispForm.aspx?ID=44

[27] Source: Folha de S. Paulo, 17/10/2007, http://www1.folha.uol.com.br/fsp/dinheiro/fi1710200730.htm

[28] Source: http://www.epe.gov.br/PressReleases/20070618_1.pdf

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The project activity mainly reduces CO2 emissions through substitution of power and heat generation with fossil fuels by energy generation with biomass. The emission reduction *ERy* by the project activity during a given year *y* is the difference between the emission reductions through substitution of heat generation with fossil fuels (*ERheat,y*), the emission reductions through substitution of electricity generation with fossil fuels (*ERelectricity,y*), and project emissions (*PEy*), emissions due to leakage (*Ly*) and, where this emission source is included in the project boundary and relevant, baseline emissions due to the natural decay or burning of anthropogenic sources of biomass (*BEbiomass,y*), as follows:

$$ER_y = ER_{heat,y} + ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y \qquad \textbf{Equation 1}$$

where:

ER_y: are the emissions reductions of the project activity during the year *y* in tons of CO_2,

$ER_{heat,y}$: are the emission reductions due to displacement of heat during the year *y* in tons of CO_2,

$ER_{electricity,y}$: are the emission reductions due to displacement of electricity during the year *y* in tons of CO_2,

$BE_{biomass,y}$: are the baseline emissions due to natural decay or burning of anthropogenic sources of biomass during the year *y* in tons of CO_2 equivalents,

PE_y: are the project emissions during the year *y* in tons of CO_2, and

L_y: are the leakage emissions during the year *y* in tons of CO_2.

Emission reductions from heat are not considered because the thermal efficiency of the project plant is larger than the heat efficiency of the reference plant, as shown in section B.4. For conservativeness reasons, they are excluded, i.e., $ER_{heat,y}$=0.

Baseline emissions from uncontrolled burning or decay of biomass in the baseline scenario are not included, as shown in section B.4. , i.e. $BE_{biomass,y}$=0 (Scenario B4).

PROJECT EMISSIONS

Project emissions include CO2 emissions from transportation of biomass to the project site (*PETy*), CO2 emissions from on-site consumption of fossil fuels due to the project activity (*PEFFy*), CO_2 emissions due to electricity consumption/importation from grid at the project site (*PEEC,y*) and, where this emission source is included in the project boundary and relevant, CH4 emissions from the combustion of biomass (*PEBiomass,CH4,y*).

$$PE_y = PET_y + PEFF_y + PE_{EC,y} + GWP_{CH4}.\left(PE_{Biomass,CH4,y} + PE_{WW,CH4,y}\right) \qquad \textbf{Equation 2}$$

Where:

PET_y = CO2 emissions during the year *y* due to transport of the biomass residues to the project plant (tCO2/yr)

$PEFF_{,y}$ = CO2 emissions during the year y due to fossil fuels co-fired by the generation facility or other fossil fuel consumption at the project site that is attributable to the project activity (tCO2/yr)

$PE_{EC,y}$ = CO2 emissions during the year y due to electricity consumption at the project site that is attributable to the project activity (tCO2/yr)

GWP_{CH4} = Global Warming Potential for methane valid for the relevant commitment period

$PE_{Biomass,CH4,y}$ = CH4 emissions from the combustion of biomass residues during the year y (tCH4/yr)

$PE_{WW,CH4,y}$ = CH4 emissions from waste water generated from the treatment of biomass residues in year y (tCH4/yr)

There is no transportation of biomass, once bagasse is produced inside project site. Hence, $PET_y = 0$.

Also, there is no fossil fuel consumption. All energy necessary on-site is provided by the project activity and no fossil fuel is co-fired ($PEFFy$=0). The decay of biomass is not considered in a conservative way ($PE_{biomass,CH4,y}$) and the emissions from waste water are not considered because the wastewater is not treated under anaerobic conditions ($PE_{ww,CH4,y}$). Moreover, the only wastewater generated in the biomass (sugarcane) process is the vinasse, which would occur also in the baseline scenario with no CDM project.

Finally, during the out of season period project will consume grid electricity. The off season goes from middle of November to middle of April next year, and the energy consumption aims to supply energy for maintenance works. The consumption of electricity during the off season would occur both in the project activity as in the baseline scenario. In this way, no emissions are to be considered. Besides, since captive renewable power generation technologies are installed to provide electricity both in the project activity as well as in the baseline scenario, the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" does not apply.

Therefore, project emissions (PE_y) are zero.

LEAKAGE EMISSIONS

The main emissions giving rise due to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing and transport), and increase in emissions from fossil fuel combustion due to diversion of biomass from other uses to the project plant as a result of the project activity.

Project participants do not need to consider these emissions sources as leakage in applying this methodology in the scenario 4, because the diversion of biomass to the project activity is already considered in the calculation of baseline reductions. Therefore:

$$L_y = 0$$ **Equation 3**

EMISSIONS REDUCTIONS

Emission reductions due to displacement of electricity are calculated by multiplying the net quantity of increased electricity generated with biomass as a result of the project activity (EGy) with the CO_2 baseline emission factor for the electricity displaced due to the project ($EF_{electricity,y}$), as follows:

$$ER_{electricity,y} = EG_y \cdot EF_{electricity,y}$$ **Equation 4**

For the scenario 4, EGy is determined as the difference between the electricity generation in the project plant and the quantity of electricity that would be generated by other power plant(s) using the same quantity of biomass residues that is fired in the project plant, as follows:

$$EG_y = EG_{project\_plant,y} - \varepsilon_{el,other\_plant} \cdot \frac{1}{3.6} \cdot \sum_k BF_{k,y} \cdot NCV_k$$ **Equation 5**

Where:

$EG_{project\ plant,y}$: net quantity of electricity generated in the project plant during year y (MWh)

$\varepsilon_{el,\ other\ plant}$: average net energy efficiency of electricity generation in (the) other plant that would use the biomass residues fired in the project plant in absence of the project activity ($MWh_{el}/MWh_{biomass}$)

$BF_{k,y}$: quantity of biomass residue type k combusted in the project plant during year y (tons of dry matter)

NCV_k: net calorific value of the biomass residue type k (GJ/ton of dry matter)

From the explanations above, we have the emissions reductions of the project activity calculated as:

$$ER_y = ER_{electricity,y} = EF_y * EG_y$$ **Equation 7**

Calculation of Emission Factor for grid electricity (*EF*$_{grid}$)

For the calculation of emissions from grid electricity (EF_{grid}) the approved methodology tool "Tool to calculate the emission factor for an electricity system" ver.02 is applied.

The Brazilian DNA made available the operating margin emission factor calculated using option c, of this tool: dispatch data analysis OM. The Brazilian DNA has published the resolution number 8, issued on 26/05/2008, which defines the Brazilian Interconnected Grid as a single system**,** which covers all the five macro-geographical regions of the country (North, Northeast, South, Southeast and Midwest). More information of the methods applied can be obtained in the DNA's website (http://www.mct.gov.br/index.php/content/view/4016.html) and vintage will be used in the project activity.

The baseline emission factor of the grid for this project will be estimated (*ex ante*) based on the values presented by the Brazilian DNA for 2006. The harvest period in Brazilian Southeast region goes roughly from the end of April to the end of November. Taking the 2006 emission factors, the result is the following (see CER calculation spreadsheet).

The combined margin is calculated as follows:

$$EF_{grid,y} = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$$ **Equation 8**

Where the weights w_{OM} and w_{BM}, are, for the first crediting period: $w_{OM} = 0.50$; $w_{BM} = 0.50$).

With these numbers, applying the formula presented above, we have:

$$EF_y = 0.50 \times 0.3232 + 0.50 \times 0.0814$$

The estimated emission factor is 0.2023 tCO_2/MWh.

B.6.2. Data and parameters that are available at validation:

Data / Parameter	**εel, reference plant**
Data unit:	MWh_{el} / $MWh_{biomass}$
Description:	Average net energy efficiency of electricity or heat generation in the reference power plant that would be constructed in the absence of the project activity.
Source of data used:	See section B.6.3
Value applied:	0.035 (3.5%)
Justification of the choice of data or description of measurement methods and procedures actually applied :	See section B.6.3
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

The Tables below show estimation data on total energy generated, auxiliary systems energy consumption and bagasse consumption of the Project. The calculation is done according to the formulas in section B.6.1.

Years	**Total generated (MWh)**
2011 (from October 1 on)	42,171
2012	224,535
2013	239,659
2014	257,790
2015	309,348
2016	309,348
2017	309,348
2018 (until September 30)	243,821

Years	**Energy consumed by auxiliary systems (MWh)**
2011 (from October 1 on)	3,071
2012	14,843
2013	14,843

2014	14,843
2015	14,843
2016	14,843
2017	14,843
2018 (until September 30)	11,699

Years	**Dry bagasse consumption (metric tonnes)**
2011 (from October 1 on)	64,862
2012	345,352
2013	368,614
2014	396,501
2015	475,801
2016	475,801
2017	475,801
2018 (until September 30)	375,016

Bagasse amount is estimated from the planned sugarcane production, using plant specific average values for bagasse per sugarcane ratio and bagasse humidity. From the bagasse amount, a third part engineering company designed the power plant capacity, also using statistical value for net calorific value of the bagasse.

Calculation of $\varepsilon_{el,\ reference\ plant,\ y}$

In his PhD thesis Seabra (2008) [29] evaluated the use of bagasse and cane trash for power generation with conventional steam cycles. Taking as reference plant a configuration with a low-pressure boiler (22 kgf/cm^2), he concluded that, at current energy prices, the only financially interesting option would be the use of a configuration with a high-pressure boiler of 65 kgf/cm^2 and extraction condensing turbines, which is the usual configuration for CDM projects in Brazil. See below a figure with the comparison of the costs of surplus energy generation for different configurations with 65 and 90 kgf/cm^2 boilers.

[29] Seabra, J. E. A. (2008) "Technical-economic evaluation of options for whole use of sugar cane biomass in Brazil," UNICAMP, Brazil (available at http://libdigi.unicamp.br/document/?code=vtls000446190, accessed on 1 April 2010).

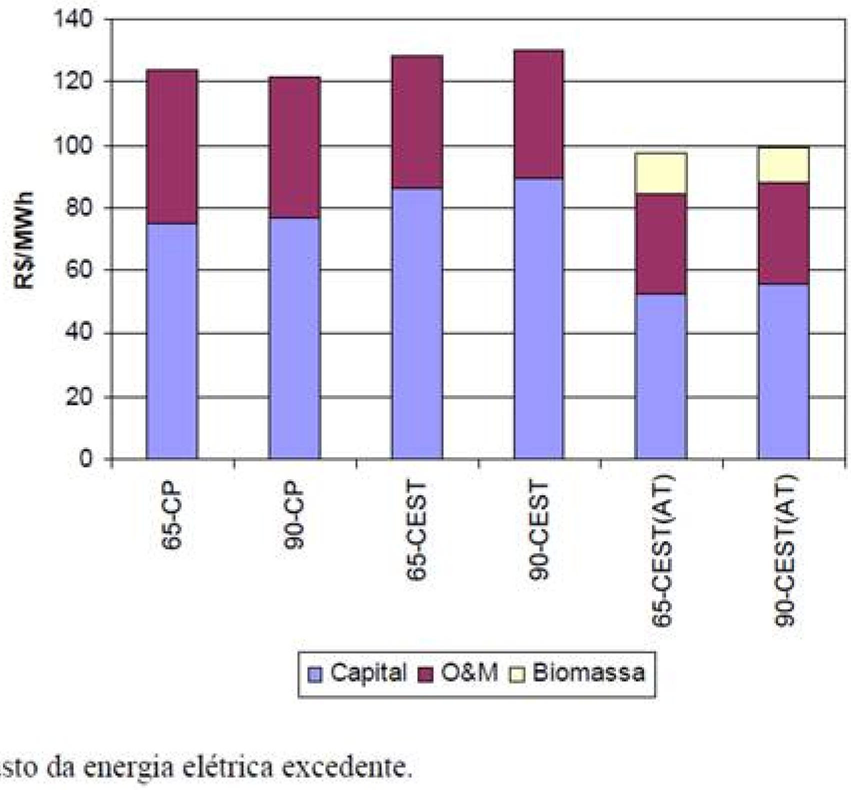

Figure 5 – Cost of surplus electricity (Brazilian Real/MWh)

Note: CP stands for "counter-pressure turbines;" CEST for "condensing extraction steam turbines" and AT for "co-firing of straw."

A plant with a 22 kgf/cm^2 boiler is taken by the author as "reference plant", which is "only interested in the production of sugar and ethanol". The author adds: "Since the potential capacity for the generation of energy surplus in this reference plant is very small (and not always commercialized), values associated to a possible sale of energy were not considered".

This information on the reference plant is supported by the number and type of boilers installed in the sugar and ethanol industry in the state of São Paulo, which concentrates 60% of Brazilian sugarcane production. Out of 439 boilers installed in the state of São Paulo, 366 are 21 kgf/cm^2 boilers, representing 83% of the total[30].

Based on data informed by Seabra (2008), it is possible to estimate the electrical efficiency of this reference plant.

According to Seabra (2008), the consumption of energy for the reference plant is 12 KWh/t sugarcane. Considering that the reference plant produces energy only for own consumption, and conservatively[31]

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[30] Source: São Paulo State Sanitation and Energy Secretary (http://bit.ly/dJl8tx, accessed on 15. March 2011). Copy of the document was also submitted to the validation team.

[31] Compared to the literature: 26-27% (FIESP/CIESP, 2001, "Ampliação da oferta de Energia através da Biomassa," available at http://bit.ly/9M1Zyx, accessed on 6 April 2010) and 25.5-28% (BNDES, 2008, "Bioetanol de cana-de-açúcar: energia para o desenvolvimento sustentável," available at http://www.bioetanoldecana.org/, accessed on 6 April 2010).

assuming that the amount of bagasse produced is 26% of the amount of sugarcane produced, the consumption of energy, in KWh/t bagasse would be 48. Taking a bagasse NCV of 8.2 MJ/kg (source:Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual. See section 1.4.3.), i.e., one tonne of bagasse generating 2.28 MWh, the electrical efficiency of this reference plant would be 2.11%. This would be the average electrical efficiency of the "average reference plant" in Brazil.

CTC (2010)[32], the largest sugarcane technology center in Brazil[33], estimated the efficiency of electricity generation in typical (reference) Brazilian sugarcane mills that do not export electricity into the grid. The study assess typical configurations for plants built/retrofitted before 2001 (21 kgf/cm^2 boilers with multiple-stage turbo-generators for power generation and steam-driven mills with single-stage turbines) and after 2001 (21 kgf/cm^2 boilers with multiple stage turbo-generators for power generation and steam-driven mills with multiple-stage turbines). For average plants built/retrofitted before 2001 the average electrical efficiency obtained is 2.5%. For average plants built/retrofitted after 2001 the average electrical efficiency obtained is 3.5%.

Project participants also studied the electrical efficiency of "recently constructed reference plants".

First, it was compared the list of sugar mills in Brazil, in harvests 2004/2005 and 2006/2007, from the information provided by Unica (http://bit.ly/9vJW9q, site accessed on 6 April 2010). Mills which were present in the 2006/2007 sugar cane production ranking, but not in 2004/2005, were considered new.

Then, it was checked in the site of ANEEL (http://bit.ly/cWulRd, accessed on 1 April 2010) the registration of these new mills, to verify which of them are already operating and producing electricity. Four mills were found, with high pressure boilers (65 kgf/cm^2), and all of them are CDM projects (in different phases). Only two mils were found, which are independent energy producers and not CDM projects (names submitted to the DOE). They have low-pressure boilers (21kgf/cm^2) and may export their energy surplus to the grid (they have the legal permission to export). Five other new mills with low-pressure boilers are registered in the site of ANEEL, but are not operating yet.

The reference plants selected are the mills with low-pressure boilers which may have a small energy surplus (these values are calculated in spreadsheet "Reference Plants_Efficiency_2010.01.20.xls" (submitted to DOE):

- A (started operations in May/2006) – electrical efficiency: 2.93%

- B (started operations in April/2005) – electrical efficiency: 3.06%;

Conservatively taking the highest efficiency of these reference plants, εel, reference plant = 0.035.

From these values, EGy is calculated, according to the equations in section B.6.1, as shown in the annexed CERs calculation spreadsheet, with the results shown below:

Year	$EG_{projectplant,\ y}$ (MWh) – net generated	EG_y (MWh) – net increase
2011 (from October 1)	39,100	28,884
2012	209,693	155,300
2013	224,816	166,760

[32] Centro de Tecnologia Canavieira (2010). Determinação da eficiência elétrica das usinas brasileiras para produção exclusiva de açúcar e/ou etanol.

[33] See http://bit.ly/c35fgi, accessed on 8 April 2010.

2014	242,948	180,499
2015	294,506	219,567
2016	294,506	219,567
2017	294,506	219,567
2018 (until September 30)	232,123	173,058

For detailed ex-ante CER estimation, please refer to CER calculation spreadsheet.

B.6.4 Summary of the ex-ante estimation of emission reductions:

Table 7 – Ex-ante Estimation of Emissions Reductions

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2011 (from October 1)	0	5,844	0	5,844
2012	0	31,419	0	31,419
2013	0	33,737	0	33,737
2014	0	36,517	0	36,517
2015	0	44,421	0	44,421
2016	0	44,421	0	44,421
2017	0	44,421	0	44,421
2018 (until September 30)	0	35,011	0	35,011
Total (tonnes of CO_2e)	0	275,791	0	275,791

Note: Baseline emissions values in this project is the Emission Reductions due to displacement of electricity ($ER_{electricity,y}$).

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

The project owner will continuously measure the energy generated, delivered to the grid and consumed internally.

Grid Emission Factor parameters

Data / Parameter:	***$EF_{grid,y}$***
Data unit:	tCO_2/MWh
Description:	CO2 emission factor for grid electricity during the year *y*
Source of data used:	Data provided by the Brazilian DNA (http://www.mct.gov.br/index.php/content/view/72901.html)
Value applied::	0.2023
Justification of the choice of data or description of measurement methods and procedures actually applied	The emission factor estimative is *ex-ante*, calculated according to CERs calculation spreadsheet. Its monitoring will be *ex-post*.
Any comment:	The grid emission factor was calculated by the Brazilian DNA (available at: http://www.mct.gov.br/index.php/content/view/307492.html), using the Dispatch Data Analysis for the Operating Margin. The Build Margin emission factor was determined using the generation-weighted average emission factor of all power units during the most recent year for which power generation data was available. Therefore, the emission factor of used in the PDD was accepted just for estimating the expected emission reductions of the project activity during the crediting period. Hence, the emission factor calculation used in this PDD, for estimating purposes only, must be verified and updated accordingly, using the most recent data available at the time of the verification process.

Data / Parameter:	***$EF_{BMgrid,y}$***
Data unit:	tCO_2/MWh
Description:	CO2 build margin emission factor for grid electricity during the year *y*
Source of data used:	Data provided by the Brazilian DNA (http://www.mct.gov.br/index.php/content/view/72901.html)
Value applied:	0.0814
Justification of the choice of data or description of measurement methods and procedures actually applied :	The emission factor estimative is *ex-ante*, calculated according to CER calculation spreadsheet. Its monitoring will be *ex-post*.
Any comment:	It was determined using the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available.

Data / Parameter:	***$EF_{OMgrid,y}$***
Data unit:	tCO_2/MWh
Description:	CO2 operating margin emission factor for grid electricity during the year *y*
Source of data used:	Data provided by the Brazilian DNA (http://www.mct.gov.br/index.php/content/view/72901.html)
Value applied:	0.3232
Justification of the choice of data or description of	The emission factor estimative is *ex-ante*, calculated according to CER calculation spreadsheet. Its monitoring will be *ex-post*.

measurement methods and procedures actually applied :	
Any comment:	The hourly emissions factor is determined as per equation 11 of the Tool to calculate the emission factor for an electricity system, version 2 and option (a) 10% for the determination of the units in the top x% of total electricity dispatched in the hour h is chosen.

Project Parameters

Data / Parameter:	$BF_{k,y}$
Data unit:	Tons of dry matter
Description:	*Quantity of biomass residue type k combusted in the project plant during the year y*
Source of data to be used:	On-site continuous measurement (prepare annually an energy balance).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See section B.6.3
Description of measurement methods and procedures to be applied:	Weight meters by conveyor scale. Adjusted by moisture content in order to determine the quantity of dry biomass. Bagasse is generated on-site, and after milling, is transported by belt conveyors, where it is weighted. There are 3 belt weight scales: - Total bagasse generated (1); - Bagasse send to storage (2); - Bagasse transported from storage to supply the boiler (3). (1) – (2) = bagasse directly supplied to the boiler, without being stored (4). Biomass residue combusted = (3) + (4)
QA/QC procedures to be applied:	Measurements are crosschecked with an annual energy balance, based on The quantity of electricity generated. Measurement accuracy is 1%. The manufacture Toledo performs maintenance and calibration, if necessary, twice a year. Necessity is determined according to the applicable legislation from INMETRO (ordinances 236/94 and 261/02, see http://bit.ly/cP3sWv, site accessed on 27.Aug.2010).Internal Zero adjustment is made once a year.
Any comment:	

Data / Parameter:	*Moisture content of the biomass residues*
Data unit:	% water content
Description:	*Moisture content of each biomass residue type k*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	52.2

Description of measurement methods and procedures to be applied:	Regular analysis and measurements of the main characteristics of the plant operation are carried out, the average values from the 2008 and 2009 seasons, 47.8% fiber and 52.2% moisture will be used at the time of validation for estimation purposes (spreadsheet with average values "memorial de calculo.xls" supplied to the DOE). Methodology according to CTC (Spencer Electric Oven Method, copy of the procedure submitted to the DOE). CTC (Sugarcane Technology Center, see http://www.ctcanavieira.com.br) started operation in 1969 and is worldwide recognized as an excellence research center for the sector. It also produces standards and performs analysis for the sugarcane processing industry. The submitted standard is, therefore, a local sectoral standard prepared by a recognized local expert center. The moisture content should be monitored for each batch of biomass of homogeneous quality. The weighted average should be calculated for each monitoring period and used in the calculations. In the present project activity case only one biomass quality is used (sugarcane bagasse). Samples are collected each 2 hours and analysis is made each 4 hours in a composted sample. Mean value is calculated annually.
QA/QC procedures to be applied:	Accuracy: 1% Equipments utilized in Interlagos laboratory are tested for accuracy by CTC once a year. CTC is accredited by INMETRO, the (Brazilian Institute of Metrology, Normalisation and Industrial Quality.
Any comment:	-

Data / Parameter:	NCV_k
Data unit:	GJ/ton of dry matter
Description:	*Net calorific value of biomass residue type k*
Source of data to be used:	CTC analysis report. Measurement will be carried out by CTC laboratory, on dry basis.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Value used in the PDD, for estimation purposes, is 16.2 GJ/ton (source: Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual. See section 1.4.3.).
Description of measurement methods and procedures to be applied:	At least 3 samples collection every 6 months. Samples will be sent to CTC and analyzed according to their standards (ASME PTC 4).
QA/QC procedures to be applied:	Data will be cross-checked with local statistical values and with measurements from previous years of the crediting period. Accuracy of calorimeter: 1%. Consistency of measurements will be checked with default values by the IPCC.
Any comment:	

Data / Parameter:	$EG_{project\ plant,y}$
Data unit:	MWh/year
Description:	*Net quantity of electricity generated in the project plant during year y*
Source of data to be	On-site measurement

used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See section B.6.1
Description of measurement methods and procedures to be applied:	Measured and calculated. Continuously electronic measurement of the total generated amount and the energy consumed in the auxiliary system of cogeneration plant. Net quantity is calculated subtracting the auxiliary consumption from the total generated.
QA/QC procedures to be applied:	Consistency of net electricity generation will be cross-checked with the quantity of bagasse fired. Data is being monitored by the Usina Interlagos as explained in Annex 4
Any comment:	-

B.7.2 Description of the monitoring plan:

The main data to be considered in determining the emissions reductions is the net electricity generation and, consequently, the exported to the grid. The emissions reduction is calculated by multiplying the emissions factor with the net quantity of increased electricity generation (EG_y), which is based on the net quantity of electricity generated in the project plant[34] ($EG_{project\ plant,y}$, monitored parameter defined in section B.7.1), average net efficiency of electricity generation in the reference plant ($\varepsilon_{el,other\ plant(s)}$, parameter available at validation defined in section B.6.2), quantity of biomass residue (bagasse) combusted ($BF_{k,y}$, monitored parameter defined in section B.7.1) and net calorific value of the biomass residue(NCV_k, monitored parameter defined in section B.7.1), in accordance with ACM0006, v.10.1, equation 14.

The electricity dispatched to the grid (net electricity generated) is verified and monitored by a two party verification: by the power plant that sells the electricity and by the utility company that buys the electricity.

In the power plant, data is monitored through a spreadsheet that collects information of the energy meters installed at the output of cogeneration plant and cross-checked with the sales receipts issued by the electricity utility to Interlagos.

All operators, quality control analysts, managers, etc. were contracted 1 year before the start of Usina Interlagos operation and received on-site training at the Usina Santa Adélia plant, which is a plant of the same group.

Usina Interlagos is constructing an analytical laboratory to analyze all parameters concerned to alcohol and energy production, including quantity of biomass combusted and moisture content and net calorific value of the biomass residue.

Regarding grid emission factors, figures published the Brazilian DNA will be used.

An organogram of plant utilities is presented below. The sector is divided in four groups, electricity automation, maintenance, steam production and quality control, each with one supervisor. Each supervisor

[34] Emissions reduction calculation is based on the net electricity generation increase, i.e., the net electricity generation in the project activity scenario (total electricity generation minus auxiliary system consumption) minus the generation in the baseline scenario (see section B.6.3).

reports to the industrial manager and has a technician responsible for the interaction with the workers operators in the plant.

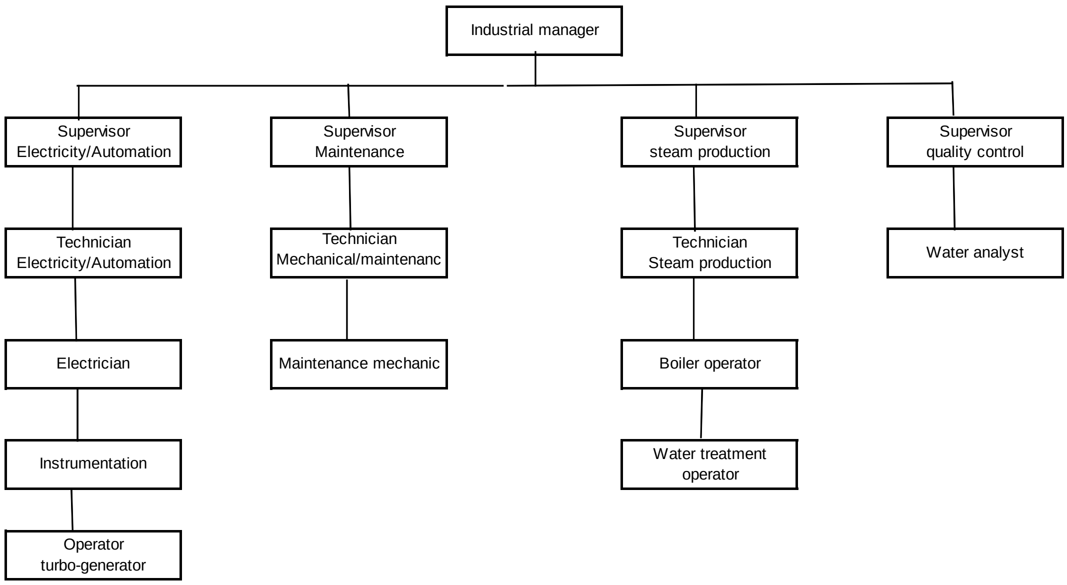


Figure 6 - Cogeneration Power Plant Operation Structure

See Annex 4 for details.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

Date of completing the final draft of this baseline section (DD/MM/YYYY):23/02/2010.

Name of person/entity determining the grid emission factor:

Company:	Ecopart Assessoria em Negócios Empresariais Ltda.
Address:	Rua Padre João Manoel, 222
Zip code + city address:	01411-000 São Paulo, SP
Country:	Brazil
Contact person:	Ricardo Esparta
Job title:	Director
Telephone number:	+55 (11) 3063-9068
Fax number:	+55 (11) 3063-9069
E-mail:	ricardo.esparta@eqao.com.br

Name of person/entity determining the baseline of ACM0006:

Company:	Ecopart Assessoria em Negócios Empresariais Ltda.
Address:	Rua Padre João Manoel, 222
Zip code + city address:	01411-000 São Paulo, SP
Country:	Brazil
Contact person:	Ricardo Esparta

Telephone number: +55 (11) 3063-9068
Fax number: +55 (11) 3063-9069
E-mail: ricardo.esparta@eqao.com.br

Ecopart is the Project Advisor and also a Project Participant.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

Starting date: 30/08/ 2005.

According to the CDM PDD Guidelines the project starting date is the earliest between the construction, implementation or real action in favor of the project activity, i.e.**,** the date on which project participants have committed to expenditures related to the implementation or related to the construction of the project activity.

In order to asses which of those occurred first the following events were considered:

- Financial Closure: 04/09/2006 which represents the date in which Interlagos signed the financing contract with BNDES.

- Issuance of the Construction Permit: issued on 20/09/2006 by CETESB – the Environmental Agency of São Paulo

- Purchase of the main equipment (turbine, boiler and generator): the boiler was bought on 13th September, 2005; generator was bought in 30th August, 2005 and the turbine on 25th September, 2005. These are the dates when Interlagos paid the first installment of 10% of the total price of the equipments. The rest was paid in the end of 2006 when the equipments started to be installed/constructed in the plant.

Hence the staring date of the project activity was defined as **30/08/2005.**

C.1.2. Expected operational lifetime of the project activity:

25y-0m

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

(DD/MM/YYYY): 01/10/2011

C.2.1.2. Length of the first crediting period:

7y-0m.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The growing global concern on sustainable use of resources is driving a requirement for more sensitive environmental management practices. Increasingly this is being reflected in government policy and legislation. In Brazil the situation is not different. Environmental rules and licensing policies are very demanding in line with the best international practices.

As the Usina Interlagos project is a power plant construction based on energy efficiency, the fast-track procedure can be used (Preparation of a Preliminary Environmental Report – "Relatório Ambiental Preliminar," RAP). The process has been completed and a report containing an investigation of the following aspects has been produced:

- Resources usage
- Legislation to be observed
- Impacts to climate and air quality
- Geological and soil impacts
- Hydrological impacts (surface and groundwater)
- Impacts to the flora and animal life
- Socio-economical (necessary infra-structure, legal and institutional, etc.)
- Local stakeholders comments
- Mitigation measures and Monitoring plan

In Brazil, the sponsor of a project that involves construction, installation, expansion or operation, even with no new significant environmental impact, must obtain new licenses. The licenses required by the Brazilian environmental regulation are (Resolution n. 237/97):

- The preliminary license ("Licença Prévia" or L.P.),
- The construction license ("Licença de Instalação" or L.I.); and
- The operating license ("Licença de Operação" or L.O.).

Usina Interlagos has the authorization issued by ANEEL to operate as an independent power producer (ANEEL Decree 219 dated 03/08/2006). This authorization was transferred to Usina Santa Adélia S.A. through ANEEL Resolution nr. 1119 dated 27th November, 2007. Moreover, the power plant has the licenses emitted by *Companhia de Tecnologia de Saneamento Ambiental* (CETESB), the environmental agency of the state of São Paulo.

On 20 April 2007, a temporary Operating License nr 13000307 related to 15MW energy production[35] (which was the initial planning), and temporary Operating License nr. 13000308 related to changes in the original project (one of the changes mentioned in the license is the power capacity increase from 15 to 40MW, which is the project's first phase installed power capacity), were issued for 180 days operation. On

[35] See Installation License 13001173, dated 13/Jul/2007 (submitted to the DOE, including an excerpt of the project description indicating the installed power of 15 MW).

06 May 2008 new Operating License – nr. 13001541 related to 15MW power plant[36], and Operating License nr 13001542, related to changes in the original project (including the power capacity expansion from 15 MW to 40 MW), were issued valid until 06/05/2010 (under renewal). For the future expansion of additional 40MW (project's second phase), started Public Audience (Stakeholder Comment Process) on 11 September 2008. After the audience is closed, the licensing process will be started, first applying for the Preliminary License.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

After the assessment of the preliminary environmental report by the state environmental authority some minor requirements were made in order to issue the licenses. The project sponsors are fulfilling all the requirements. In conclusion, the environmental impact of the project activity is not considered significant and no full environmental impact assessment, as EIA/RIMA, was required.

Moreover, the project activity does not imply transboundary environmental impacts.

[36] Both licenses, for the original plant and for the plant changes, have to be regularly renewed.

SECTION E. Stakeholders’ comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

Public discussion with local stakeholders is compulsory for obtaining the environmental construction and operating licenses, and once the project already received the licenses, the project has consequently gone through a stakeholder comments process. The legislation also requests the announcement of the issuance of the licenses (LP, LI and LO) in the official journal (*Diário Oficial da União*) and in the regional newspaper to make the process public and allow public information and opinion.

Additionally, the Brazilian Designated National Authority for the CDM, *Comissão Interministerial de Mudanças Globais do Clima*, requires the compulsory invitation of selected stakeholders (copies of these invitations under request) to comment the PDD sent to validation in order to provide the letter of approval.

Letters inviting for comments on the project were sent by courier on 13th October 2006 to the following organizations and entities:

- *Pereira Barreto City Hall;*
- *Municipal Assembly of Pereira Barreto;*
- *Environmental Agency of the State of São Paulo;*
- *State Attorney for the Rights of Citizens of the State of São Paulo;*
- *Fórum Brasileiro de ONGs e Movimentos Sociais para o Desenvolvimento e Meio Ambiente ;*
- *Environmental Agency of Pereira Barreto;*
- *Associação Brasileira de Ecologia e de Prevenção à Poluição das Águas e do Ar – ABEPPOLAR.*

Copies of the invitation letters and receipts (*ARs – Avisos de Recebimento*) are available with project proponents. No concerns were raised in the public calls regarding the project.

E.2. Summary of the comments received:

FBOMS sent a letter suggesting the use of Gold Standard or similar tools.

E.3. Report on how due account was taken of any comments received:

The project participants consider that requests made by the Brazilian Government are sufficient to be used as sustainable indicators which are attended by this CDM project activity.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Usina Santa Adélia S/A
Street/P.O.Box:	Rodovia SP 326 - Km 332, Fazenda Santa Adélia
Building:	
City:	Jaboticabal
State/Region:	São Paulo
Postfix/ZIP:	14870-970 - Caixa Postal 54
Country:	Brazil
Telephone:	+ 55 (16) 3209-2007
FAX:	+ 55 (16) 3209-2074
URL:	http://www.usinasantaadelia.com.br/
Represented by:	
Title:	
Salutation:	Mr
Last Name:	Braido
Middle Name:	Roberto
First Name:	José
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	jbraido@usinasantaadelia.com.br

Organization:	Ecopart Assessoria em Negócios Empresariais Ltda.
Street/P.O.Box:	Rua Padre João Manoel 222
Building:	
City:	São Paulo
State/Region:	São Paulo
Postfix/ZIP:	01411-000
Country:	Brazil
Telephone:	+55 (11) 3063-9068
FAX:	+55 (11) 3063-9069
URL:	www.eqao.com.br
Represented by:	
Title:	
Salutation:	Miss
Last Name:	Hirschheimer
Middle Name:	
First Name:	Melissa
Department:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	mailto:melissa.hirschheimer@eqao.com.br

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved on the Usina Interlagos Cogeneration Project. This project does not receive any public funding and it is not a diversion of Official Development Assistance (ODA) flows.

Annex 3

BASELINE INFORMATION

The Brazilian electricity system, for the purpose of CDM activities, was delineated as a single interconnected system comprehending the five geographical regions of the country (North, Northeast, South, Southeast and Midwest). This was determined by the Brazilian DNA through its Resolution number 8 issued on 26/05/2008.

More information is publicly available at the Brazilian DNA website[37].

[37] http://www.mct.gov.br/index.php/content/view/327850.html

Annex 4

MONITORING INFORMATION

All Monitoring Procedures and Manuals will be prepared during the test operation that will be held in March 2007, before the harvest start.

The emissions reduction is calculated by multiplying the emissions factor with the net quantity of increased electricity generation *(EG_y)*, which is based on the plant´s bagasse consumption and bagasse *NCV*. Energy generation metering/monitoring will be used to cross-check the results.

Energy Generation Monitoring

The electricity baseline emission factor is determined using ex-post vintage date calculated and supplied by the Brazilian DNA. The recording frequency of the data is appropriate for the project.

The project sponsor will proceed with the necessary measures for the power control and monitoring. Together with the information produced by both ANEEL and ONS, it will be possible to monitor the power generation of the project and the grid power mix.

Usina Interlagos is responsible for the project management, monitoring and reporting as well as for organizing and training of the staff in the appropriate monitoring, measurement and reporting techniques.

The monitoring plan is straightforward and no specific procedures beyond the established QA/QC procedures will be necessary. The established procedures reflect good monitoring and reporting practices. The maintenance and installation of monitoring equipment will be done according to the internal procedures of Usina Interlagos.

The methodology considers monitoring emissions reductions generated from cogeneration projects using sugarcane bagasse. The monitoring plan, for emissions reductions occurring within the project boundary, is based on monitoring the amount of electricity generated subtracted by the amount that would be generated in a business-as-usual reference plant.

Energy generated in project activity ($EG_{project\ plant,y}$)

Generated energy is hourly monitored by the cogeneration plant operator and duty electrician. Data will be cross-checked with energy sale receipt added by internal consumption monitored by process control software and energy balance from the quantity of bagasse fired. Exported energy is also read monthly by an operator from the energy company.

Generated Energy meter is under Usina Interlagos responsibility using a relay Schweitzer, model SEL 300G, accuracy 0.5%.

Energy consumed in the auxiliary system (consumed by cogeneration plant itself) is calculated by summing all consumption in the subsystems of the cogeneration plant. Each subsystem has a meter with the following description: Relay SEL- Schweitzer Electric Laboratories, Model SEL-351-A, manufactured in 2006, accuracy 0.5%.

The net energy generated in the project activity ($EG_{project\ plant,y}$) will be the total energy generated by the plant (exported electricity plus the energy consumed internally by the mill) subtracted by the consumption of the auxiliary systems of the electrical plant. Consistency of net electricity generation will be cross-checked with the quantity of bagasse fired.

Exported Energy meter is under Energy Company Elektro responsibility using *Power Measurement Ltd* multifunctional meter, ELEKTRO Standard, Model ION 8300, socket type, accuracy Class 0,2S (<0.3%). There will be a back-up energy meter of the same manufacturer and model. There are 4 (four) meters, 2 back-up. Four meters are used because there are two transmission circuits in the plant (two transmission lines in parallel), each with two meters, one main meter and one backup meter.

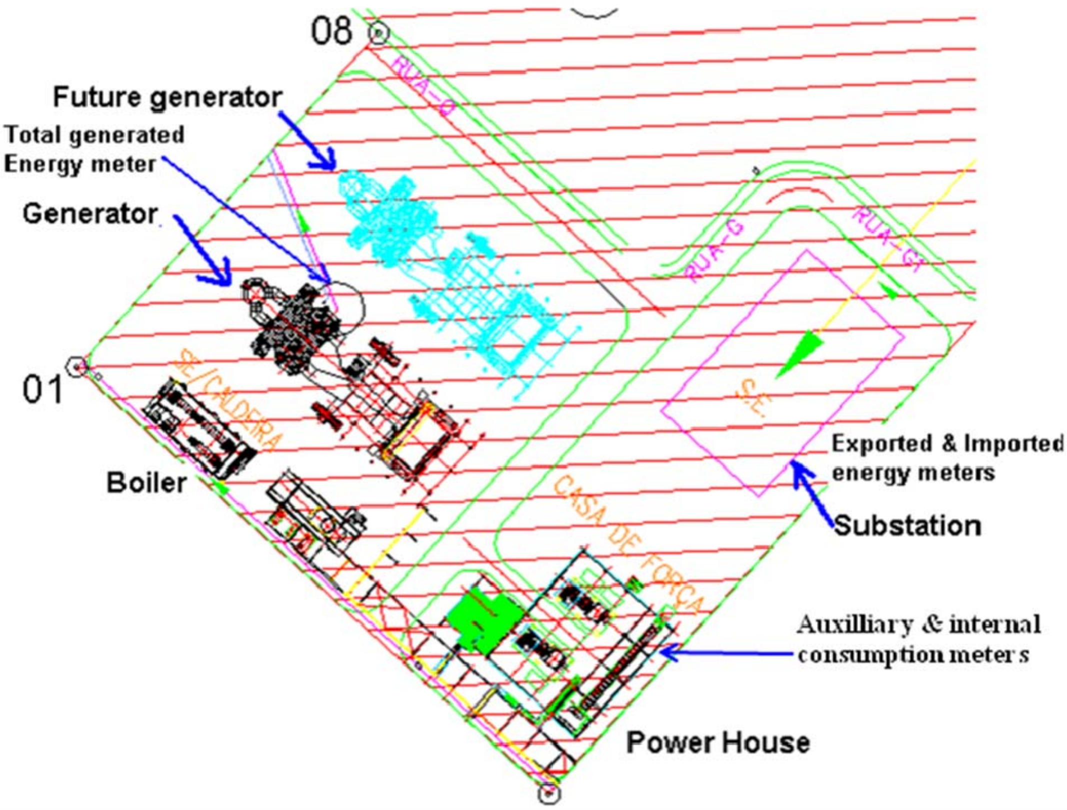
The power utility Elektro is responsible to inform CCEE – *Câmara Comercializadora de Energia Elétrica* about the total of the energy delivered to the grid. CCEE makes feasible and regulates the electricity energy commercialization.

Measurements will be done according to the regulations of ANEEL, *Procedimentos de Distribuição de Energia Elétrica no Sistema Elétrico Nacional – PRODIST – Módulo 5 – Sistemas de Medição*, document PND1A-DE8-0550, of October 20, 2005 (http://bit.ly/fKiPze).

Energy meters under Usina Interlagos responsibility will be calibrated each 5 years as set by manufacturer.

Energy meter under Elektro - electricity company responsibility will be calibrated each 1 year.

As there is no back-up energy meter for the generated electricity, when this meter goes down, it will be calculated from the sum of exported energy and internal consumed amount, checking with energy balance and past historical data.



Bagasse analysis

Bagasse amount ($BF_{k,y}$) is weighted on the scales at the belt-conveyors that transport the bagasse.

There are 3 points of measurement: total bagasse generated and send to boiler, amount of excess bagasse send to storage, and amount of bagasse transported from storage to the boiler. Total bagasse consumed amount will be calculated as: [(total bagasse – storage bagasse) + storage to boiler bagasse].

Humidity is analyzed each 4 hours with composite sample collect each 2 hours in the Interlagos own laboratory, and cross-checked with regional statistical data.

Net Calorific value of biomass (NCV_k) will be analyzed each 6 months collecting at least 3 samples. The samples will be sent to CTC laboratory.

All data monitored will be stored accordingly to Interlagos quality control management system.

Amount of energy generated, internally consumed, exported and the quantity of bagasse fired data will be archived in the document FO.ID.01.26.0020 of the Usina Interlagos quality control management system. Energy amounts are also digitally archived automatically through the process control software.

Bagasse humidity data will be archived in the document FO.ID.01.27.0003 of the Usina Interlagos quality control management system.

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